

INVITATION FOR BIDS

PEACEKEEPER STORAGE FACILITY

Hill Air Force Base, Utah

IFB NO. DACA05-97-B-0082

SPECIFICATION NO. 9777

DRAWING FILE NO. 180-25-770

JOB HAZARD - ASBESTOS



US ARMY CORPS OF ENGINEERS
Sacramento District

DIRECTIVE NO. #2, DTD. 31 May 96
PROJECT NO. 963007

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NOTE:

AS A MINIMUM ANY CONTRACT AWARDED AS A RESULT OF THIS
SOLICITATION SHALL CONSIST OF THE FOLLOWING DOCUMENTS:

STANDARD FORM 1442, SECTIONS 00010, 00700, 00800, TECHNICAL
SPECIFICATIONS AND DRAWINGS, AND ATTACHMENTS AS DESCRIBED IN
CONTRACT DOCUMENT.

SECTION 00600, AS COMPLETED BY AWARDEE, IS INCORPORATED INTO
ANY RESULTANT CONTRACT BY REFERENCE.

SECTION 00100 IS INCLUDED FOR SOLICITATION PURPOSES ONLY. THIS
SECTION WILL BE REMOVED, MAINTAINED IN THE CONTRACT FILE AND
NOT MADE PART OF THE CONTRACT.

AMENDMENTS ARE INCORPORATED INTO THE RESULTANT CONTRACT.

SUBCONTRACTING PLAN (IF REQUIRED) BECOMES AN ATTACHMENT TO AND A
MATERIAL PART OF THE CONTRACT.

INFORMATION TO OFFERORS OR BIDDERS**COVER SHEET****1. SOLICITATION NUMBER**DACA05-97-B-0082
Spec. No. 9777**2. (X one)**

x

a. SEALED BID**b. NEGOTIATED (RFP)****c. NEGOTIATED (RFQ)****INSTRUCTIONS**

NOTE THE AFFIRMATIVE ACTION REQUIREMENT OF THE EQUAL OPPORTUNITY CLAUSE WHICH MAY APPLY TO THE CONTRACT RESULTING FROM THIS SOLICITATION.

You are cautioned to note the "Certification of Non-Segregated Facilities" in the solicitation. Failure to agree to the certification will render your reply nonresponsive to the terms of solicitations involving awards of contracts exceeding \$25,000 which are not exempt from the provisions of the Equal Opportunity clause.

"Fill-ins" are provided on the face and reverse of Standard Form 1442 or other solicitation documents and Sections of Table of Contents in this solicitation and should be examined for applicability.

See the provision of this solicitation entitled either "Late Bids, Modifications of Bids or Withdrawal of Bids" or "Late Proposals, Modifications of Proposals and Withdrawals of Proposals."

When submitting your reply, the envelope used must be plainly marked with the Solicitation Number, as shown above, and the date and local time set forth for bid opening or receipt of proposals in the solicitation document.

If NO RESPONSE is to be submitted, detach this sheet from the solicitation, complete the information requested on reverse, fold, affix postage, and mail. NO ENVELOPE IS NECESSARY.

Replies must set forth full, accurate, and complete information as required by this solicitation (including attachments). The penalty for making false statements is prescribed in 18 U.S.C. 1001.

3. ISSUING OFFICE (Complete mailing address, including Zip Code)

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
ATTN: CONTRACTING DIVISION, PLAN ROOM
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

4. ITEMS TO BE PURCHASED (Brief description)

SEE SF-1442, BLOCK 10.

TYPE OF CONTRACT: SEE SECTION 00100, FAR CLAUSE 52.216-1

5. PROCUREMENT INFORMATION (X and complete as applicable)

x

a. THIS PROCUREMENT IS UNRESTRICTED**b. THIS PROCUREMENT IS A 100 % SET-ASIDE FOR ONE OF THE FOLLOWING (X one).**
(See Section 00700)**(3) Combined Small Business/Labor Area Concerns****(1) Small Business [8(a)]****(2) Labor Surplus Area Concerns****(4) Small Disadvantaged Business Concerns****6. ADDITIONAL INFORMATION**

COMPLETE DETAILS FOR PROPER SUBMISSION OF BIDS ARE FOUND IN SECTIONS 00100, 00600 AND ATTACHMENTS. REMINDER: ACKNOWLEDGE ALL AMENDMENTS (FILL IN BACK PAGE OF SF-1442 OR RETURN SIGNED COPY OF SF-30). IF ANY OF THE AMENDMENTS FURNISHED AMENDED PAGES WHICH ARE PART OF THE BID, THE AMENDED PAGES MUST BE USED IN THE BID.

BID WILL INCLUDE:

- A. COMPLETED AND SIGNED SF-1442 (SECTION 00010)
- B. COMPLETED PRICING SCHEDULE (SECTION 00010)
- C. COMPLETED REPRESENTATIONS/CERTIFICATIONS (SECTION 00600)
- D. DD FORM 2051, CAGE CODE (SEE SECTION 00100, DFARS 252.204-7001, AND ATTACHMENTS). COMPLETE AND SUBMIT IF YOU DO NOT HAVE A CAGE CODE)
- E. BID GUARANTEE
- F. ACKNOWLEDGEMENT OF AMENDMENTS, IF ANY AMENDMENTS WERE ISSUED
- G. ANY OTHER DOCUMENTS REQUIRED BY THE SOLICITATION (SEE ATTACHMENTS SECTION)

7. POINT OF CONTACT FOR INFORMATION**a. NAME (Last, First, Middle Initial)**

SEE SECTION 00100

b. ADDRESS (Include Zip Code)**c. TELEPHONE NUMBER (Include Area Code and Extension) (NO COLLECT CALLS)**

SEE SECTION 00100

SAME AS BLOCK 3 ABOVE

8. REASONS FOR NO RESPONSE <i>(X all that apply)</i>			
a. CANNOT COMPLY WITH SPECIFICATIONS		b. CANNOT MEET DELIVERY REQUIREMENT	
c. UNABLE TO IDENTIFY THE ITEM(S)		d. DO NOT REGULARLY MANUFACTURE OR SELL THE TYPE OF ITEMS INVOLVED	
e. OTHER <i>(Specify)</i>			
9. MAILING LIST INFORMATION <i>(X one)</i>			
YES	NO	WE DESIRE TO BE RETAINED ON THE MAILING LIST FOR FUTURE PROCUREMENT OF THE TYPE OF ITEM(S) INVOLVED.	
10. RESPONDING FIRM			
a. COMPANY NAME		b. ADDRESS <i>(Include Zip Code)</i>	
c. ACTION OFFICER			
(1) Typed or Printed Name <i>(Last, First, Middle Initial)</i>	(2) Title	(3) Signature	(4) Date Signed <i>(YYMMDD)</i>

DD Form 1707 Reverse, MAR 89

FOLD

FOLD

FOLD

FOLD

FROM

AFFIX
STAMP
HERE


SOLICITATION NUMBER	
DATE <i>(YYMMDD)</i>	LOCAL TIME

TO

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
ATTN: CONTRACTING DIVISION, PLAN ROOM
1325 J STREET
SACRAMENTO, CA 95814-2922

SECTION 00010

SOLICITATION, OFFER AND AWARD (STANDARD FORM 1442)
AND PRICING SCHEDULE

SOLICITATION, OFFER, AND AWARD <i>(Construction, Alteration, or Repair)</i>	1. SOLICITATION NO. DACA05-97-B-0082	2. TYPE OF SOLICITATION <input checked="" type="checkbox"/> SEALED BID (IFB) <input type="checkbox"/> NEGOTIATED (RFP)	3. DATE ISSUED 97 SEP 25	PAGE OF PAGES 1
	IMPORTANT - The "offer" section on the reverse must be fully completed by offeror.			
4. CONTRACT NO.	5. REQUISITION/PURCHASE REQUEST NO.	6. PROJECT NO.		
7. ISSUED BY CODE	8. ADDRESS OFFER TO			
DEPARTMENT OF THE ARMY U.S. ARMY ENGINEER DISTRICT, SACRAMENTO CORPS OF ENGINEERS 1325 J STREET SACRAMENTO, CALIFORNIA 95814-2922		DEPARTMENT OF THE ARMY U.S. ARMY ENGINEER DISTRICT, SACRAMENTO UTAH AREA OFFICE 7227 6TH STREET, BUILDING 366 HILL AIR FORCE BASE, UTAH 84056-5214		
9. FOR INFORMATION CALL: 	A. NAME See SECTION 00100	B. TELEPHONE NO. (Include area code) (NO COLLECT CALLS) See SECTION 00100		

SOLICITATION

NOTE: In sealed bid solicitations, "offer" and "offeror" mean "bid" and "bidder".

10. THE GOVERNMENT REQUIRES PERFORMANCE OF THE WORK DESCRIBED IN THESE DOCUMENTS (Title, identifying no., date):

PEACEKEEPER STORAGE FACILITY
HILL AIR FORCE BASE, UTAH

Specification No. 9777

Description: PROVIDE TWO NEW FOUR-BAY PROPELLANT STORAGE MAGAZINES. THIS INCLUDES EXCAVATION FOR EARTH COVERED, CONCRETE REINFORCED STRUCTURES. STORAGE MAGAZINES WILL HAVE; TRAIN RAIL ACCESS, LOADING/RECEIVING DOCKS, ACCESS ROADS, SECURITY FENCING/MONITORING SYSTEMS AND NECESSARY SUPPORT (UTILITY CONNECTIONS, FIRE PROTECTION, ALARMS, ETC.).

Estimated Cost Range of Project: \$5,000,000 - 10,000,000

Any Contract awarded under this solicitation will be made pursuant to Public Law 100-656, Small Business Competitiveness Demonstration Program. See DD Form 1707, Block 5 for unrestricted/set-aside information.

11. The Contractor shall begin performance within <u>10</u> calendar days and complete it within <u>365</u> calendar days after receiving <input type="checkbox"/> award, <input checked="" type="checkbox"/> notice to proceed. This performance period is <input checked="" type="checkbox"/> mandatory, <input type="checkbox"/> negotiable (See <u>SECTION 00800, FAR 52.211-10</u> .)	
12A. THE CONTRACTOR MUST FURNISH ANY REQUIRED PERFORMANCE AND PAYMENT BONDS? (If "YES," indicate within how many calendar days after award in Item 12B.) <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	12B. CALENDAR DAYS Ten (10)
13. ADDITIONAL SOLICITATION REQUIREMENTS:	
A. Sealed offers in original and <u>0</u> copies to perform the work required are due at the place specified in Item 8 by <u>2:00 PM</u> (hour) local time, <u>97 OCT 28</u> (date). If this is a sealed bid solicitation, offers will be publicly opened at that time. Sealed envelopes containing offers shall be marked to show the offeror's name and address, the solicitation number, and the date and time offers are due.	
B. An offer guarantee <input checked="" type="checkbox"/> is, <input type="checkbox"/> is not required.	
C. All offers are subject to the (1) work requirements, and (2) other provisions and clauses incorporated in the solicitation in full text or by reference.	
D. Offers providing less than <u>60</u> calendar days for Government acceptance after the date offers are due will not be considered and will be rejected.	

OFFER (Must be fully completed by offeror)

14. NAME AND ADDRESS OF OFFEROR (Include ZIP Code)

15. TELEPHONE NO. (Include area code)

() FAX ()

16. REMITTANCE ADDRESS (Include only if different than Item 14)

CEC: _____ CAGE CODE: _____

CODE

FACILITY CODE

17. The offeror agrees to perform the work required at the prices specified below in strict accordance with the terms of this solicitation, if this offer is accepted by the Government in writing within _____ calendar days after the date offers are due. (Insert any number equal to or greater than the minimum requirement stated in Item 13D. Failure to insert any number means the offeror accepts the minimum in Item 13D.)

AMOUNTS

See Pricing Schedule

18. The offeror agrees to furnish any required performance and payment bonds.

19. ACKNOWLEDGEMENT OF AMENDMENTS

(The offeror acknowledges receipt of amendments to the solicitation - give number and date of each)

AMENDMENT NO.										
DATE										

20A. NAME AND TITLE OF PERSON AUTHORIZED TO SIGN OFFER
(Type or print)

20B. SIGNATURE

20C. OFFER DATE

AWARD (To be completed by Government)

See pg. 3 for 20D

21. ITEMS ACCEPTED:

22. AMOUNT

23. ACCOUNTING AND APPROPRIATION DATA

24. SUBMIT INVOICES TO ADDRESS SHOWN IN
(4 copies unless otherwise specified)

ITEM

25. OTHER THAN FULL AND OPEN COMPETITION PURSUANT TO

☐ 10 U.S.C. 2304(c) () ☐ 41 U.S.C. 253(c) ()

26. ADMINISTERED BY

CODE

27. PAYMENT WILL BE MADE BY

CONTRACTING OFFICER WILL COMPLETE ITEM 28 OR 29 AS APPLICABLE

☐ 28. NEGOTIATED AGREEMENT (Contractor is required to sign this document and return _____ copies to issuing office.) Contractor agrees to furnish and deliver all items or perform all work requirements identified on this form and any continuation sheets for the consideration stated in this contract. The rights and obligations of the parties to this contract shall be governed by (a) this contract award, (b) the solicitation, and (c) the clauses, representations, certifications, and specifications incorporated by reference in or attached to this contract.

☐ 29. AWARD (Contractor is not required to sign this document.) Your offer on this solicitation is hereby accepted as to the items listed. This award consummates the contract, which consists of (a) the Government solicitation and your offer, and (b) this contract award. No further contractual document is necessary.

30A. NAME AND TITLE OF CONTRACTOR OR PERSON AUTHORIZED TO SIGN
(Type or Print)

31A. NAME OF CONTRACTING OFFICER (Type or Print)

30B. SIGNATURE

30C. DATE

31B. UNITED STATES OF AMERICA

31C. AWARD DATE

BY

BLOCK 20D:

(1) IF THE OFFEROR IS A JOINT VENTURE, EACH PARTICIPANT IN THE JOINT VENTURE MUST COMPLETE THE FOLLOWING:

_____ Company Name	_____ Signature	_____ Title
_____ Company Name	_____ Signature	_____ Title
_____ Company Name	_____ Signature	_____ Title

NOTE: If a corporation is participating as a member of a Joint Venture, the certificate below must also be completed and signed.

CORPORATION AUTHORIZATION TO PARTICIPATE IN JOINT VENTURE CERTIFICATE

I, _____, certify that I am the Secretary of the corporation
(name)
named as a participant in a Joint Venture on this offer; that
_____, who signed said offer on behalf of the corporation, was
(name)
then _____ of said corporation; that the signature thereto is
(title)
genuine; that said contract was duly signed, sealed and attested for and in
behalf of said corporation by authority of its governing body; and that the
corporation is authorized to participate in the Joint Venture on this offer.

(Name of Corporation)

(Secretary)

(2) IF THE OFFEROR IS A PARTNERSHIP, LIST FULL NAME OF ALL PARTNERS BELOW. SIGNATURES BY ALL PARTNERS HERE SIGNIFY THAT THE INDIVIDUAL WHO SIGNED THE OFFER IN BLOCK 20B HAS THE AUTHORITY TO BIND THE PARTNERSHIP.

_____ Name	_____ Signature
_____ Name	_____ Signature
_____ Name	_____ Signature

(3) IF THE OFFEROR IS A CORPORATION, THE OFFER SHALL BE SIGNED IN THE CORPORATE NAME FOLLOWED BY THE WORD "BY" AND THE SIGNATURE OF THE PERSON AUTHORIZED TO SIGN THE OFFER IN BLOCK 20B. PROVIDE PROOF THAT THE PERSON SIGNING FOR THE CORPORATION HAS THE AUTHORITY TO BIND THE CORPORATION BY COMPLETING THE FOLLOWING CERTIFICATE:

CORPORATION AUTHORIZATION CERTIFICATE

I, _____, certify that I am the Secretary of the
(name)
corporation named as offeror in the within offer; that _____,
(name)
who signed said offer on behalf of the corporation, was then

_____ of said corporation, that the signature
(title)
thereto is genuine; that said contract was duly signed, sealed and attested
for in behalf of said corporation by authority of its governing body.

(Name of Corporation)

(Secretary)

(4) IF THE OFFEROR IS AN INDIVIDUAL DOING BUSINESS AS A FIRM, THE OFFER SHALL
BE SIGNED BY THAT INDIVIDUAL IN BLOCK 20B FOLLOWED BY THE WORDS "AN INDIVIDUAL
DOING BUSINESS AS _____ (INSERT NAME OF FIRM).

(5) WHEN AN AGENT SIGNS THE OFFER, PROVIDE PROOF OF THE AGENT'S AUTHORITY TO
BIND THE PRINCIPAL.

PRICING SCHEDULE

CONTRACTOR SHALL FURNISH ALL PLANT, LABOR, MATERIAL, EQUIPMENT, ETC. NECESSARY TO PERFORM ALL WORK IN STRICT ACCORDANCE WITH THE TERMS AND CONDITIONS SET FORTH IN THE CONTRACT TO INCLUDE ALL ATTACHMENTS THERETO.

ITEM NO.	DESCRIPTION	AMOUNT
0001	PEACEKEEPER STORAGE FACILITY, COMPLETE TO THE 5-FOOT BUILDING LINE	\$ _____
0002	SITE WORK AND UTILITIES OUTSIDE THE 5-FOOT BUILDING LINE	\$ _____
TOTAL PRICE		\$ _____

1. Prices must be submitted on all individual items of this Pricing Schedule. Failure to do so may be cause for rejection of bids.

2. If a modification to a price is submitted which provides for a lump sum adjustment to the total price, the application of the lump sum adjustment to each item in the Pricing Schedule must be stated. If it is not stated, the bidder/offeror agrees that the lump sum adjustment shall be applied on a pro rata basis to every item in the Pricing Schedule.

3. EFARS 52.214-5000 APPARENT CLERICAL MISTAKES - ARITHMETIC DISCREPANCIES
(DEC 1995)--EFARS

(a) For the purpose of initial evaluation of bids/offers, the following will be utilized in resolving arithmetic discrepancies found on the face of the Pricing Schedule as submitted by bidders/offerors:

- (1) Obviously misplaced decimal points will be corrected;
- (2) Discrepancy between unit price and extended price, the unit price will govern;
- (3) Apparent errors in extension of unit prices will be corrected;
- (4) Apparent errors in addition of lump-sum and extended prices will be corrected.

(b) For the purpose of bid/offer evaluation, the Government will proceed on the assumption that the bidder/offeror intends the bid/offer to be evaluated on basis of the unit prices, the total arrived at by resolution of arithmetic discrepancies as provided above and the bid/offer will be so reflected on the abstract of bids/offers.

(c) These correction procedures shall not be used to resolve any ambiguity concerning which bid is low.

SECTION 00100

INSTRUCTIONS, CONDITIONS AND NOTICES TO BIDDERS/OFFERORS
AND EVALUATION CRITERIA FOR AWARD

SECTION 00100

INSTRUCTIONS, CONDITIONS AND NOTICES TO BIDDERS/OFFERORS
AND EVALUATION CRITERIA FOR AWARD

1. FAR 52.252-1 SOLICITATION PROVISIONS INCORPORATED BY
REFERENCE (JUN 1988)

This solicitation incorporates one or more solicitation provisions by reference, with the same force and effect as if they were given in full text. Upon request, the Contracting Officer will make their full text available.

SOLICITATION PROVISIONS BY REFERENCE:

INSTRUCTIONS, CONDITIONS AND NOTICES TO BIDDERS/OFFERORS:

2. DFARS 252-204-7001 COMMERCIAL AND GOVERNMENT ENTITY (CAGE) CODE
REPORTING (DEC 1991)
3. DFARS 252.211-7003 BRAND NAME OR EQUAL (DEC 1991)
(APPLICABLE IF SPECS CALL OUT A BRAND NAME)
4. FAR 52.214-1 SOLICITATION DEFINITIONS--SEALED BIDDING
(JUL 1987)
5. FAR 52.214-3 AMENDMENTS TO INVITATIONS FOR BIDS
(DEC 1989)
6. FAR 52.214-4 FALSE STATEMENTS IN BIDS (APR 1984)
7. FAR 52.214-5 SUBMISSION OF BIDS (MAR 1997)
8. FAR 52.214-6 EXPLANATION TO PROSPECTIVE BIDDERS
(APR 1984)
9. FAR 52.214-7 LATE SUBMISSIONS, MODIFICATIONS, AND WITHDRAWALS
OF BIDS (MAY 1997)
10. FAR 52.214-18 PREPARATION OF BIDS--CONSTRUCTION
(APR 1984)
11. FAR 52.214-19 CONTRACT AWARD--SEALED BIDDING--CONSTRUCTION
(AUG 1996)
12. FAR 52.214-34 SUBMISSION OF OFFERS IN THE ENGLISH LANGUAGE
(APR 1991)
(APPLICABLE IF DFARS 252.225-7007 OR 252.225-
7036 OR FAR 52.225-15 ARE APPLICABLE - SEE
SECTION 00700)
13. FAR 52.214-35 SUBMISSION OF OFFERS IN U.S. CURRENCY
(APR 1991)
(APPLICABLE IF DFARS 252.225-7007 OR 252.225-
7036 OR FAR 52.225-15 ARE APPLICABLE - SEE
SECTION 00700)

EVALUATION CRITERIA FOR AWARD:

THE FOLLOWING SOLICITATION PROVISIONS ARE INCLUDED IN FULL TEXT

INSTRUCTIONS, CONDITIONS AND NOTICES TO BIDDERS/OFFERORS:

14. SAACONS 52.0214-4581 INQUIRIES (APR 1992)
15. SAACONS 52.0214-4582 DIRECTIONS FOR SUBMITTING BIDS/PROPOSALS (APR 1992)
16. FAR 52.236-27 SITE VISIT (CONSTRUCTION) (FEB 1995), ALTERNATE I (FEB 1995)
17. SAACONS 52.0209-4501 CONTRACTOR RESPONSIBILITY, PREAWARD SURVEY (JUL 1995)
18. FAR 52.211-14 NOTICE OF PRIORITY RATING FOR NATIONAL DEFENSE USE (SEP 1990)
19. DFARS 252.211-7002 AVAILABILITY FOR EXAMINATION OF SPECIFICATIONS, STANDARDS, PLANS, DRAWINGS, DATA ITEM DESCRIPTIONS, AND OTHER PERTINENT DOCUMENTS (DEC 1991)
20. SAACONS 52.0211-4805 AVAILABILITY OF SPECIFICATIONS, STANDARDS AND DESCRIPTIONS (OCT 1992)
21. SAACONS 52.0214-4583 TELEGRAPHIC BIDS/OFFERS (APR 1992)
22. SAACONS 52.0214-4584 FACSIMILE BIDS/OFFERS (APR 1992)
23. FAR 52.216-1 TYPE OF CONTRACT (APR 1984)
24. SAACONS 52.0219-4581 PREPARATION OF SUBCONTRACTING PLAN (APR 1994)
25. FAR 52.222-23 NOTICE OF REQUIREMENT FOR AFFIRMATIVE ACTION TO ENSURE EQUAL EMPLOYMENT OPPORTUNITY (APR 1984)
26. SAACONS 52.0228-4504 PERFORMANCE AND PAYMENT BONDS (AUG 1991)
27. SAACONS 52.0228-4506 INDIVIDUAL SURETIES IN SUPPORT OF BID BONDS (AUG 1991)
28. SAACONS 52.228-4507 BID GUARANTEE FORM AND AMOUNT (JAN 1993)
29. DFARS 252.228-7004 BONDS OR OTHER SECURITY (DEC 1991)
30. FAR 52.233-2 SERVICE OF PROTEST (AUG 1996)
31. SAACONS 52.0236-4507 ACCEPTANCE OF OFFERS (AUG 1991)
32. FAR 52.252-3 ALTERATIONS IN SOLICITATION (APR 1984)
33. FAR 52.252-5 AUTHORIZED DEVIATIONS IN PROVISIONS (APR 1984)

EVALUATION CRITERIA FOR AWARD:

34. SAACONS 52.0214-4503 EVALUATION FOR AWARD (JAN 1991)

FULL TEXT SOLICITATION PROVISIONS:

INSTRUCTIONS, CONDITIONS AND NOTICES TO BIDDERS/OFFERORS:

14. SAACONS 52.0214-4581 INQUIRIES (APR 1992)

Perspective bidders/offerors should submit inquiries related to this solicitation by writing or calling the following (collect calls will not be accepted):

(1) For information related to amendments and information on bid opening dates or dates set for receipt of proposals:

Plan Room Fax (916) 557-7842

(2) For inquiries of a contractual nature (solicitation requirements, interpretation of contractual language) call:

Ms. Levenson-Snitz, Contract Specialist (916) 557-7945
or fax questions to (916) 557-7854.

For bid results only call (916) 557-5237. This phone line is dedicated to Government-recorded bid results; it is an unattended number and messages left may not be answered. If this number has no bid information, call the Contract Specialist above.

(3) All **technical** questions on the specifications or drawings will be submitted in writing (or faxed) to:

Department of the Army
U.S. Army Engineer District, Sacramento
Corps of Engineers
ATTN: Contracting Division
1325 J Street
Sacramento CA 95814-2922
FAX: (916) 557-7854

(4) Please include the solicitation number, project title and location of project with your questions. Written inquiries must be received by this office not later than 14 calendar days prior to bid opening date/date set for receipt of offers.

(5) For prospective bidders with electronic mail capabilities, questions of a contractual or technical nature can be sent to llevenson@usace.mil. Please include the full name of your company, as well as telephone and fax numbers, in your correspondence.

(6) Oral explanations or instructions are not binding. Any information given to a bidder/offeror which impacts the bid/offer will be given in the form of a written amendment to the solicitation.

15. SAACONS 52.0214-4582 DIRECTIONS FOR SUBMITTING BIDS/PROPOSALS
(APR 1992)

Envelopes containing bids/offers must be sealed, marked and addressed as follows:

MARK ENVELOPES:

Solicitation No. DACA05-97-B-0082
 Bid Opening/Offer Closing Date: 97 NOV 04
 Bid Opening/Offer Closing Time: 2:00 PM (LOCAL TIME)

ADDRESS ENVELOPES TO:

U.S. Army Engineer District, Sacramento
 Utah Area Office
 7227 6th Street, Bldg. 366
 Hill Air Force Base, Utah 84056-5214

Handcarried bids shall be deposited with the Corps of Engineers at the above address prior to bid opening time. For bidders planning to handcarry bids to Hill AFB for the Bid Opening, be sure to plan your time sufficiently. It may take at least 45 minutes to process you through the Visitors' Center to allow entry onto the base. There are Visitors' Centers located at the South and West Gates of the base. Be sure to bring: (1) a valid driver's license, (2) a valid car registration, and (3) proof of insurance. If you do not have all of these documents, you will not be allowed entry onto the base. If the Visitors' Center requires you to have authorization from a Corps of Engineers employee, call (801) 777-2206 or (801) 825-1505.

16. FAR 52.236-27 SITE VISIT (CONSTRUCTION) (FEB 1995), ALTERNATE I (FEB 1995)

(a) The clauses at 52.236-2, Differing Site Conditions, and 52.236-3, Site Investigations and Conditions Affecting the Work, will be included in any contract awarded as a result of this solicitation. Accordingly, offerors or quoters are urged and expected to inspect the site where the work will be performed.

(b) An organized site visit has been schedule for--
 Date & Time: 97 OCT 15 at 10:00 a.m.

(c) Participants will meet at--
 Location: The Resident Office, Hill AFB, Utah. Bidders cannot obtain access to the area without first giving the person's name and social security number at least 5 days in advance to the resident office. Phone (801) 777-2206.

17. SAACONS 52.0209-4501 CONTRACTOR RESPONSIBILITY, PREAWARD SURVEY (JUL 1995)

In order to determine a contractor's responsibility for purposes of contract award in accordance with FAR Part 9, the contractor is required to provide a statement regarding previous experience and past performance in performing comparable work, information related to the business organization, financial resources, and/or plant to be used in performing the work (see Attachments, Preaward Survey). The Preaward Survey is attached to the solicitation for information purposes only. It will be required from only the low bidder. After the Bid Opening, the Government will request this information from the low bidder if the low bidder has not had a contract with the Sacramento District within the last twelve months and the Government will set a due date for its submission. The Preaward Survey is not required as part of the bid package. In order to be determined to be responsible a prospective contractor must:

a. Have adequate financial resources to perform the contract or the ability to obtain them.

b. Be able to comply with the required or proposed delivery or performance schedule, taking into consideration all existing commercial and governmental business commitments.

c. Have a satisfactory performance record. In making the determination of responsibility, the Government Contracting Officer shall consider relevant past performance information. A prospective contractor shall not be determined responsible or nonresponsible solely on the basis of a lack of relevant performance history except when there are special standards set forth in the solicitation which applies to all bidders that must be met in order to receive the award. These special standards may be necessary when unusual expertise or specialized facilities are necessary in the performance of the contract; therefore, in order to be determined to be responsible for that particular contract, the offeror must be able to meet those special standards. A prospective contractor that is or recently has been seriously deficient in contract performance shall be presumed to be nonresponsible unless the Contracting Officer determines that the circumstances were beyond the contractor's control or that the contractor has taken appropriate corrective action. Other responsibility considerations by the Contracting Officer will include past efforts by the contractor to apply sufficient tenacity and perseverance to perform acceptably, to meet quality requirements of contracts, and the contractor's past compliance with subcontracting plans (if required) under recent contracts.

d. Have a satisfactory record of integrity and business ethics.

e. Have the necessary organization, experience, accounting and operational controls, and technical skills, or the ability to obtain them (including, as appropriate, such elements as production control procedures, property control systems, quality assurance measures, and safety programs applicable to materials to be produced or services to be performed by the prospective contractor and subcontractors).

f. Have the necessary production, construction, and technical equipment and facilities, or the ability to obtain them.

g. Be otherwise qualified and eligible to receive an award under applicable laws and regulations.

If the contractor or subcontractor does not already have sufficient resources demonstrated in the completed Preaward Survey, acceptable evidence of "the ability to obtain" the required, adequate resources (all of the resources discussed in subparagraphs a, e, and f above) normally consists of a commitment or explicit arrangement that will be in existence at the time of contract award to rent, purchase or otherwise acquire the needed facilities, equipment, other resources, or personnel. See also DFARS 252.219-7009 in this Section.

18. FAR 52.211-14 NOTICE OF PRIORITY RATING FOR NATIONAL DEFENSE USE (SEP 1990)

Any contract awarded as a result of this solicitation will be () DX rated order; (X) DO rated order certified for national defense use under the Defense Priorities and Allocations System (DPAS) (15 CFR Part 700), and the Contractor will be required to follow all of the requirements of this regulation.

19. DFARS 252.211-7002 AVAILABILITY FOR EXAMINATION OF SPECIFICATIONS, STANDARDS, PLANS, DRAWINGS, DATA ITEM DESCRIPTIONS, AND OTHER PERTINENT DOCUMENTS (DEC 1991)

The specifications, standards, plans, drawings, data item descriptions, and other pertinent documents cited in this solicitation are not available for distribution but may be examined at the following location:

US Army Engineer District, Sacramento
Plan Room
1325 J Street
Sacramento CA 95814-2922

20. SAACONS 52.0211-4805 AVAILABILITY OF SPECIFICATIONS, STANDARDS AND DESCRIPTIONS (OCT 1992)

(a) Specifications, standards and descriptions cited in this solicitation are available as indicated below:

(1) Unclassified Federal, Military and Other Specifications and Standards (Excluding Commercial) and Data Item Descriptions: Single copies of specifications cited in this solicitation may be obtained by submitting a written request to the supply point listed below. The request must contain the title of the specification, its number, date and applicable amendments. A telephone order entry system is available with the use of a touch tone telephone. A Customer Number is required to use this system and may be obtained by written request to the address listed below or by telephone (215) 697-2179. In case of urgency, telegraphic requests are acceptable.

Standardization Document
Order Desk, Building 4, Section D
700 Robbins Avenue
Philadelphia PA 19111-5094

Telex Number: 834295
Western Union Number: 710-670-1685
Telephone Number: (215) 697-3321
FAX Number: (215) 697-2978
Telephone Order Entry System (TOES) Numbers: (215) 697-1187 through and including (215) 697-1197

(b) Commercial Specifications, Standards and Descriptions: These specifications, standards and descriptions are not available from Government sources. They may be obtained from the publishers.

(c) The Department of Defense Index of Data Item Descriptions (TD-3) may be ordered on the DD Form 1425. The Department of Defense Index of Specifications and Standards (DODISS) may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

(d) Corps of Engineers Publications: The "CRD" series of Corps of Engineers specifications are available for inspection at this office. Copies can be obtained from the U.S. Army Engineer Waterways Experiment Station, ATTN: Publications Distribution, Information Services Branch, P.O. Box 631, Vicksburg, Mississippi 39180. A copy of the Corps of Engineers manual, EM 385-1-1, entitled "Safety and Health Requirements Manual" will be sent to prospective bidders upon request to the Sacramento District Office.

21. SAACONS 52.0214-4583 TELEGRAPHIC BIDS/OFFERS (APR 1992)

TELEGRAPHIC BIDS/OFFERS ARE NOT ACCEPTABLE.

However, bids/offers may be modified or withdrawn by written or telegraphic notice. Any telegram to modify or withdraw a bid/offer sent to this office must be received in the office designated in the Invitation for Bids/Request for Proposal (IFB/RFP) for receipt of bids/offers not later than the exact

date and time set for bid opening/receipt of proposals. A telegraphic modification or withdrawal of a bid/offer received in such office by telephone from the receiving telegraph office not later than the exact date and time set for bid opening/receipt of proposals shall be considered. However, the telephone message shall be confirmed by the telegraph company by sending a copy of the written telegram that formed the basis for the telephone call. The written telegram shall be sealed in an envelope by a proper official and sent to the office designated in the IFB/RFP for receipt of bids/offers. The official shall write on the envelope (1) the date and time of receipt and by whom, and (2) the number of the IFB/RFP, and shall sign the envelope. The bidder/offeror is responsible to inform the telegraph company of these requirements. No one from this office will be dispatched to the local telegraph office to pick up any telegram for any reason.

22. SAACONS 52.0214-4584 FACSIMILE BIDS/OFFERS (APR 1992)

Facsimile bids/offers, modifications thereto, or cancellations of bids/offers will not be accepted.

23. FAR 52.216-1 TYPE OF CONTRACT (APR 1984)

The Government contemplates award of a firm, fixed-price contract resulting from this solicitation.

24. SAACONS 52.0219-4581 PREPARATION OF SUBCONTRACTING PLAN (APR 1994)

(a) See FAR 52.219-9, Section 00700, of this solicitation. Located in the Attachments Section of this solicitation is a sample Subcontracting Plan which will aid the Contractor in preparing a Subcontracting Plan in accordance with FAR 52.219-9(d)(1) through (d)(11). Subcontracting Plans will be developed considering only the subcontracts actually to be awarded. Subcontracting Plans are required only from large business firms if the contract price is over \$1 million; they are not required from small business firms regardless of the contract price.

(b) The sample Subcontracting Plan is attached to this solicitation for information purposes. A Subcontracting Plan will be required only from the low bidder if the low bidder is a large business and the low bid is over \$1 million. The Subcontracting Plan is not required from the low bidder until after the Bid Opening; it is not required as part of the bid package. After the Bid Opening, if the selected bidder fails to submit an acceptable plan within the time prescribed by the Contracting Officer, the bidder will be ineligible for award. Review of the Subcontracting Plan by the Government will be in accordance with FAR 19.705-4.

(c) A Subcontracting Plan which proposes goals less than the recommended goals below must contain support, in writing, for the lesser goals and discuss the Contractor's good faith effort to meet the recommended goals.

(d) In accordance with FAR 19.704 if the contract contains options, the cumulative value of the basic contract and all options is considered in determining whether a Subcontracting Plan is necessary. If a plan is necessary, the Subcontracting Plan shall contain separate parts, one for the basic contract and one for each option. It is necessary to address planned subcontracting dollars and percentages of total to be awarded to small; small, disadvantaged; women-owned small; HBCU/MIs; and qualified nonprofit agencies for the blind and other severely disabled separately for the basic contract period and each option year. All other parts of the Subcontracting Plan only need to be addressed once.

(e) Subcontracts awarded to small, disadvantaged businesses; women-owned small businesses; HBCU/MIs; and qualified nonprofit agencies for the blind and

other severely disabled count toward the overall small business goal. HBCU/MIs are counted as a subset of the small, disadvantaged goal. The Corps of Engineers has not been assigned a set goal for HBCU/MIs or qualified nonprofit agencies for the blind and other severely disabled.

(f) Qualified nonprofit agencies for the blind and other severely disabled that have been approved by the Committee for Purchase from People Who Are Blind or Severely Disabled under the Javits-Wagner-O'Day Act (41 U.S.C. 46-48) are eligible as a result of Section 9077 of Pub. L. 102-395 and subsequent Appropriation Acts and Section 808 of Pub. L. 102-484 and 804 of Pub. L. 103-337 through September 30 1997 to participate in the program. Under this authority subcontracts awarded to such entities may be counted toward the prime contractor's small business subcontracting goal through fiscal year 1997.

(g) Contact - Mr. John Szabo (916)557-5202, Deputy for Small Business, with questions on the Subcontracting Plan requirements and further instructions on submission of Standard Forms 294 and 295 as required by FAR 52.219-9. These forms with clarifying instructions will be furnished by the Deputy for Small Business to the Contractor's Subcontracting Plan Administrator after contract award.

(h) The accepted Subcontracting Plan will be incorporated into and made a material part of the contract.

(i) The Corps of Engineers highly encourages all bidders/ offerors to meet the recommended subcontracting goals as follows:

Small Businesses	55.0%
Small, Disadvantaged Businesses	8.5%
Women-Owned Small Businesses	3.0%

The goals are calculated as a percentage of the TOTAL SUBCONTRACTING DOLLARS, NOT THE TOTAL CONTRACT AMOUNT.

NOTE: A CONTRACT AWARD BY THE GOVERNMENT TO A HIGHER EDUCATIONAL INSTITUTION (HEI) UNIVERSITY AND/OR COLLEGE WILL REQUIRED THE HEI TO CONSIDER AND AWARD 5% (TOTAL DOLLARS) TO HISTORICALLY BLACK COLLEGES, UNIVERSITIES AND MINORITY INSTITUTIONS (HBCU/MI).

25. FAR 52.222-23 NOTICE OF REQUIREMENT FOR AFFIRMATIVE ACTION TO ENSURE EQUAL EMPLOYMENT OPPORTUNITY (APR 1984)

(a) The offeror's attention is called to the Equal Opportunity clause and the Affirmative Action Compliance Requirements for Construction clause of this solicitation.

(b) The goals for minority and female participation, expressed in percentage terms for the Contractor's aggregate workforce in each trade on all construction work in the covered area, are as follows:

Goals for minority participation for each trade	Goals for female participation for each trade
6.0%	6.9%

These goals are applicable to all the Contractor's construction work performed in the covered area. If the Contractor performs construction work in a geographical area located outside of the covered area, the Contractor shall apply the goals established for the geographical area where the work is

actually performed. Goals are published periodically in the Federal Register in notice form, and these notices may be obtained from any Office of Federal Contract Compliance Programs office.

(c) The Contractor's compliance with Executive Order 11246, as amended, and the regulations in 41 CFR 60-4 shall be based on (1) its implementation of the Equal Opportunity clause, (2) specific affirmative action obligations required by the clause entitled "Affirmative Action Compliance Requirements for Construction," and (3) its efforts to meet the goals. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade. The Contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor, or from project to project, for the sole purpose of meeting the Contractor's goals shall be a violation of the contract, Executive Order 11246, as amended, and the regulations in 41 CFR 60-4. Compliance with the goals will be measured against the total work hours performed.

(d) The Contractor shall provide written notification to the Director, Office of Federal Contract Compliance Programs, within 10 working days following award of any construction subcontract in excess of \$10,000 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the--

- (1) Name, address, and telephone number of the subcontractor;
- (2) Employer's identification number of the subcontractor;
- (3) Estimated dollar amount of the subcontract;
- (4) Estimated starting and completion dates of the subcontract; and
- (5) Geographical area in which the subcontract is to be performed.

(e) As used in this Notice, and in any contract resulting from this solicitation, the "covered area" is Davis, Salt Lake, Tooele and Weber counties, Utah.

26. SAACONS 52.0228-4504 PERFORMANCE AND PAYMENT BONDS
(AUG 1991)

The bidder/offeror whose bid/offer is accepted will, within the time established in the bid, enter into a written contract with the Government and furnish performance and payment bonds on Government Standard Forms in the amounts indicated.

Within ten (10) calendar days after award and prior to Notice to Proceed the contractor shall furnish two bonds, each with good and sufficient surety or sureties acceptable to the Government, namely a performance bond (Standard Form 25) and a payment bond (Standard Form 25-A). The penal sum of such bonds will be as follows:

a. Performance Bond. The penal amount of performance bond shall be one hundred percent (100%) of the original contract price.

b. Payment Bond. The penal amount of payment bond shall equal (i) fifty percent (50%) of the contract price when the contract price is \$1,000,000 or less; (ii) forty percent (40%) of the contract price when the contract price is in excess of \$1,000,000 but not more than \$5,000,000; (iii) \$2,500,000 when the contract price is more than \$5,000,000.

Any bonds furnished will be furnished by the contractor to the Government prior to Notice to Proceed and commencement of contract performance.

27. SAACONS 52.0228-4506 INDIVIDUAL SURETIES IN SUPPORT OF BID
BONDS (AUG 1991)

Bidders/offerors utilizing individual sureties in support of a bid bond shall include a Standard Form (SF) 28 (Affidavit of Individual Surety), accompanied by a pledge of acceptable assets from each person acting as an

individual surety, and include these with the SF 24 (Bid Bond), and the bid itself (see clause titled "Pledges of Assets," FAR 52.228-11).

Pledges of acceptable assets shall be in the form of (1) evidence of an escrow account and/or (2) a recorded lien on real estate. If this is an IFB, failure to provide pledges of acceptable assets, with the bid, in the specified form, accompanied by a properly executed SF 24 and SF 28, will render the bidder nonresponsible and thus ineligible for award. If this is an RFP, failure to provide required documentation described herein may cause the offeror to be deemed "unacceptable".

28. SAACONS 52.228-4507 BID GUARANTEE FORM AND AMOUNT (JAN 1993)

When bids/proposals exceed \$25,000, the offeror shall furnish a separate bid guarantee in accordance with the solicitation provision titled "Bid Guarantee", FAR 52.228-1. In accordance with FAR 28.101-2 the bid guarantee amount shall be at least 20 percent of the "bid price" but shall not exceed \$3 million. When the penal sum is expressed as a percentage, a maximum dollar limitation may be stated. If there are option line items on the Pricing Schedule (Section 00010), the term "bid price" is hereby defined as the total bid not to include any amount for line items designated as "options". In bids/proposals that contain "additives", the "bid price" is defined as the total of all bid items including additive line items. FAR 28.106-1 states that a Standard Form (SF) 24 shall be used for the bid bond. In accordance with FAR 28.202(a)(1), corporate sureties utilized must appear on the list contained in the Department of Treasury Circular 570 titled "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and Acceptable Reinsuring Companies."

29. DFARS 252.228-7004 BONDS OR OTHER SECURITY (DEC 1991)

(a) Offerors shall furnish a bid guarantee in the amount of 20% of bid/offer with their bids/offers. The offeror receiving notice of award shall furnish--

- (1) A performance bond in the penal amount of 100% of contract price; and
- (2) Payment in full of any sum due the Government.

(b) The Contractor shall furnish the performance bond to the Contracting Officer within ten (10) days after receipt of the notice of award. The Contracting Officer will not issue the notice to proceed until receipt of an acceptable performance bond and payment of any sum due the Government.

(c) Bonds supported by sureties whose names appear on the list contained in Treasury Department Circular 570 are acceptable. Performance bonds from individual sureties are acceptable if each person acting as a surety provides a SF 28, Affidavit of Individual Surety, and a pledge of assets acceptable to the Contracting Officer.

30. FAR 52.233-2 SERVICE OF PROTEST (AUG 1996)

(a) Protests, as defined in section 33.101 of the Federal Acquisition Regulation, that are filed directly with an agency, and copies of any protests that are filed with the General Accounting Office (GAO), shall be served on the Contracting Officer (addressed as follows) by obtaining written and dated acknowledgment of receipt from:

Contracting Officer
1325 J Street, Rm 878
Sacramento, California 95814

(b) The copy of any protest shall be received in the office designated above within one day of filing a protest with the GAO.

31. SAACONS 52.0236-4507 ACCEPTANCE OF OFFERS (AUG 1991)

A written award or acceptance of an offer, mailed or otherwise furnished to the successful offeror within the time for acceptance specified in the offer, shall result in a binding contract without further action by either party.

32. FAR 52.252-3 ALTERATIONS IN SOLICITATION
(APR 1984)

Portions of this solicitation are altered as follows: N/A

33. FAR 52.252-5 AUTHORIZED DEVIATIONS IN PROVISIONS
(APR 1984)

(a) The use in this solicitation of any Federal Acquisition Regulation (48 CFR Chapter 1) provision with an authorized deviation is indicated by the addition of "(DEVIATION)" after the date of the provision.

(b) The use in this solicitation of any (48 CFR Chapter 2) provision with an authorized deviation is indicated by the addition of "(DEVIATION)" after the name of the regulation.

EVALUATION CRITERIA FOR AWARD:

34. SAACONS 52.0214-4503 EVALUATION FOR AWARD (JAN 1991)

The Government contemplates award of one contract to the responsive, responsible bidder who submits the low bid for the total of the following items in Pricing Schedule:

All line items listed in Pricing Schedule.

If the solicitation's Pricing Schedule contains options, see evaluation of options clause for information on the procedure used by the Government to determine "low bid".

END OF SECTION

SECTION 00600

REPRESENTATIONS, CERTIFICATIONS
AND OTHER STATEMENTS OF BIDDERS/OFFERORS

SECTION 00600

REPRESENTATIONS, CERTIFICATIONS
AND OTHER STATEMENTS OF BIDDERS/OFFERORS

1. FAR 52.252-1 SOLICITATION PROVISIONS INCORPORATED BY
REFERENCE (JUN 1988)

This solicitation incorporates one or more solicitation provisions by reference, with the same force and effect as if they were given in full text. Upon request, the Contracting Officer will make their full text available.

SOLICITATION PROVISIONS BY REFERENCE:

2. DFARS 252.209-7001 DISCLOSURE OF OWNERSHIP OR CONTROL BY THE
GOVERNMENT OF A TERRORIST COUNTRY
(SEP 1994)
3. DFARS 252.209-7003 DISCLOSURE OF COMMERCIAL TRANSACTION WITH THE
GOVERNMENT OF A TERRORIST COUNTRY
(SEP 1994)
4. FAR 52.214-17 AFFILIATED BIDDERS (APR 1984)
(APPLICABLE IF SEALED BIDDING)
5. FAR 52.222-21 CERTIFICATION OF NONSEGREGATED FACILITIES
(APR 1984)
6. FAR 52.223-5 POLLUTION PREVENTION AND RIGHT-TO-KNOW
INFORMATION (MAR 1997)
(APPLICABLE IN ALL SOLICITATIONS AND CONTRACTS
THAT PROVIDE FOR PERFORMANCE, IN WHOLE OR IN
PART, ON A FEDERAL FACILITY)

THE FOLLOWING SOLICITATION PROVISIONS ARE INCLUDED IN FULL TEXT

7. SAACONS 52.0201.4801 SUBMITTAL INFORMATION (NOV 1993)
8. FAR 52.203-2 CERTIFICATE OF INDEPENDENT PRICE DETERMINATION
(APR 1985)
9. FAR 52.203-11 CERTIFICATION AND DISCLOSURE REGARDING PAYMENTS
TO INFLUENCE CERTAIN FEDERAL TRANSACTIONS
(APR 1991)
10. FAR 52.204-3 TAXPAYER IDENTIFICATION (MAR 1994)
11. FAR 52.204-5 WOMEN-OWNED BUSINESS (OCT 1995)
12. FAR 52.209-5 CERTIFICATION REGARDING DEBARMENT, SUSPENSION,
PROPOSED DEBARMENT, AND OTHER RESPONSIBILITY
MATTERS (MAR 1996)
13. FAR 52.214-2 TYPE OF BUSINESS ORGANIZATION--SEALED BIDDING
(JUL 1987)
16. FAR 52.219-1 SMALL BUSINESS PROGRAM REPRESENTATION (JAN 1997)
14. FAR 52.219-2 EQUAL LOW BIDS (OCT 1995)
15. FAR 52.219-19 SMALL BUSINESS CONCERN REPRESENTATION FOR THE
SMALL BUSINESS COMPETITIVENESS DEMONSTRATION
PROGRAM (JAN 1997)
16. DFARS 252.219-7000 SMALL DISADVANTAGED BUSINESS CONCERN
REPRESENTATION (DOD CONTRACTS (APR 1994)
17. FAR 52.222-22 PREVIOUS CONTRACTS AND COMPLIANCE REPORTS
(APR 1984)
18. FAR 52.223-1 CLEAN AIR AND WATER CERTIFICATION
(APR 1984)

- 19. FAR 52.223-3 HAZARDOUS MATERIAL IDENTIFICATION AND MATERIAL SAFETY DATA (JAN 1997)
- 20. FAR 52.223-13 CERTIFICATION OF TOXIC CHEMICAL RELEASE REPORTING (OCT 1996)
- 21. DFARS 252.223-7001 HAZARD WARNING LABELS (DEC 1991)
- 22. 52.225-7006 BUY AMERICAN ACT--TRADE AGREEMENTS--BALANCE OF PAYMENTS PROGRAM CERTIFICATE (JAN 1994)
- 23. DFARS 252.225-7035 BUY AMERICAN ACT--NORTH AMERICAN FREE TRADE AGREEMENT IMPLEMENTATION ACT--BALANCE OF PAYMENTS PROGRAM CERTIFICATE (MAY 1995)
- 24. DFARS 252.247-7022 REPRESENTATION OF EXTENT OF TRANSPORTATION BY SEA (AUG 1992)

FULL TEXT SOLICITATION PROVISIONS:

7. SAACONS 52.0201.4801 SUBMITTAL INFORMATION (NOV 1993)

Solicitation Number: _____

Offeror's Name, Address, Telephone Number, and Fax Number:

Name of Person to Contact

Telephone Number

 Fax Number

Commercial & Government Entity (CAGE) Code, if known
(see Section 00100):

DUNS Number, if known:

8. FAR 52.203-2 CERTIFICATE OF INDEPENDENT PRICE DETERMINATION (APR 1985)

(a) The offeror certifies that--

(1) The prices in this offer have been arrived at independently, without, for the purpose of restricting competition, any consultation, communication, or agreement with any other offeror or competitor relating to (i) those prices, (ii) the intention to submit an offer, or (iii) the methods or factors used to calculate the prices offered;

(2) The prices in this offer have not been and will not be knowingly disclosed by the offeror, directly or indirectly, to any other offeror or competitor before bid opening (in the case of a sealed bid solicitation) or contract award (in the case of a negotiated solicitation) unless otherwise required by law; and

(3) No attempt has been made or will be made by the offeror to induce any other concern to submit or not to submit an offer for the purpose of restricting competition.

(b) Each signature on the offer is considered to be a certification by the signatory that the signatory--

(1) Is the person in the offeror's organization responsible for determining the prices being offered in this bid or proposal, and that the signatory has not participated and will not participate in any action contrary to subparagraphs (a)(1) through (a)(3) above; or

(2)(i) Has been authorized, in writing, to act as agent for the following principals in certifying that those principals have not participated, and will not participate in any action contrary to subparagraphs (a)(1) through (a)(3) above

(insert full name of person(s) in the offeror's organization responsible for determining the prices offered in this bid or proposal, and the title of his or her position in the offeror's organization);

(ii) As an authorized agent, does certify that the principals named in subdivision (b)(2)(i) above have not participated, and will not participate, in any action contrary to subparagraphs (a)(1) through (a)(3) above; and

(iii) As an agent, has not personally participated, and will not participate, in any action contrary to subparagraphs (a)(1) through (a)(3) above.

(c) If the offeror deletes or modifies subparagraph (a)(2) above, the offeror must furnish with its offer a signed statement setting forth in detail the circumstances of the disclosure.

9. FAR 52.203-11

CERTIFICATION AND DISCLOSURE REGARDING PAYMENTS
TO INFLUENCE CERTAIN FEDERAL TRANSACTIONS
(APR 1991)

(a) The definitions and prohibitions contained in the clause, at FAR 52.203-12, Limitation on Payments to Influence Certain Federal Transactions, included in this solicitation, are hereby incorporated by reference in paragraph (b) of this certification.

(b) The offeror, by signing its offer, hereby certifies to the best of his or her knowledge and belief that on or after December 23, 1989,--

(1) No Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress on his or her behalf in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment or modification of any Federal contract, grant, loan, or cooperative agreement;

(2) If any funds other than Federal appropriated funds (including profit or fee received under a covered Federal transaction) have been paid, or will be paid, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress on his or her behalf in connection with this solicitation, the offeror shall complete and submit, with its offer, OMB standard form LLL, Disclosure of Lobbying Activities, to the Contracting Officer; and

(3) He or she will include the language of this certification in all subcontract awards at any tier and require that all recipients of subcontract awards in excess of \$100,000 shall certify and disclose accordingly.

(c) Submission of this certification and disclosure is a prerequisite for making or entering into this contract imposed by section 1352, title 31, United States Code. Any person who makes an expenditure prohibited under this provision or who fails to file or amend the disclosure form to be filed or amended by this provision, shall be subject to a civil penalty of not less than \$10,000, and not more than \$100,000, for each such failure.

10. FAR 52.204-3

TAXPAYER IDENTIFICATION (MAR 1994)

(a) Definitions.

"Common parent," as used in this solicitation provision, means that corporate entity that owns or controls an affiliated group of corporations that files its Federal income tax returns on a consolidated basis, and of which the offeror is a member.

"Corporate status," as used in this solicitation provision, means a designation as to whether the offeror is a corporate entity, an unincorporated entity (e.g., sole proprietorship or partnership), or a corporation providing medical and health care services.

"Taxpayer Identification Number (TIN)," as used in this solicitation provision, means the number required by the IRS to be used by the offeror in reporting income tax and other returns.

(b) All offerors are required to submit the information required in paragraphs (c) through (e) of this solicitation provision in order to comply

with reporting requirements of 26 U.S.C. 6041, 6041A, and 6050M and implementing regulations issued by the Internal Revenue Service (IRS). If the resulting contract is subject to the reporting requirements described in FAR 4.903, the failure or refusal by the offeror to furnish the information may result in a 31 percent reduction of payments otherwise due under the contract.

(c) Taxpayer Identification Number (TIN).

☐ TIN: _____.

☐ TIN has been applied for.

☐ TIN is not required because:

☐ Offeror is a nonresident alien, foreign corporation, or foreign partnership that does not have income effectively connected with the conduct of a trade or business in the U.S. and does not have an office or place of business or a fiscal paying agent in the U.S.;

☐ Offeror is an agency or instrumentality of a foreign government;

☐ Offeror is an agency or instrumentality of a Federal, state, or local government;

☐ Other. State basis. _____

(d) Corporate Status.

☐ Corporation providing medical and health care services, or engaged in the billing and collecting of payments for such services;

☐ Other corporate entity;

☐ Not a corporate entity;

☐ Sole proprietorship

☐ Partnership

☐ Hospital or extended care facility described in 26 CFR 501(c)(3) that is exempt from taxation under 26 CFR 501(a).

(e) Common Parent.

☐ Offeror is not owned or controlled by a common parent as defined in paragraph (a) of this clause.

☐ Name and TIN of common parent:

Name _____

TIN _____

11. FAR 52.204-5

WOMEN-OWNED BUSINESS (OCT 1995)

(a) Representation. The offeror represents that it () is, () is not a women-owned business concern.

(b) Definition. "Women-owned business concern," as used in this provision, means a concern which is at least 51 percent owned by one or more women; or in the case of any publicly owned business, at least 51 percent of the stock of which is owned by one or more women; and whose management and daily business operations are controlled by one or more women.

12. FAR 52.209-5

CERTIFICATION REGARDING DEBARMENT, SUSPENSION, PROPOSED DEBARMENT, AND OTHER RESPONSIBILITY MATTERS (MAR 1996)

(a)(1) The Offeror certifies, to the best of its knowledge and belief, that--

(i) The Offeror and/or any of its Principals--

(A) Are / / are not / / presently debarred, suspended, proposed for debarment, or declared ineligible for the award of contracts by any Federal agency;

(B) Have / / have not / /, within a three-year period preceding this offer, been convicted of or had a civil judgment rendered against them for: commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, state, or local) contract or subcontract; violation of Federal or state antitrust statutes relating to the submission of offers; or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property; and

(C) Are / / are not / / presently indicted for, or otherwise criminally or civilly charged by a governmental entity with, commission of any of the offenses enumerated in subdivision (a)(1)(i)(B) of this provision.

(ii) The Offeror has / / has not / /, within a three-year period preceding this offer, had one or more contracts terminated for default by any Federal agency.

(2) "Principals," for the purposes of this certification, means officers; directors; owners; partners; and, persons having primary management or supervisory responsibilities within a business entity (e.g., general manager; plant manager; head of a subsidiary, division, or business segment, and similar positions).

THIS CERTIFICATION CONCERNS A MATTER WITHIN THE JURISDICTION OF AN AGENCY OF THE UNITED STATES AND THE MAKING OF A FALSE, FICTITIOUS, OR FRAUDULENT CERTIFICATION MAY RENDER THE MAKER SUBJECT TO PROSECUTION UNDER SECTION 1001, TITLE 18, UNITED STATES CODE.

(b) The Offeror shall provide immediate written notice to the Contracting Officer if, at any time prior to contract award, the Offeror learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

(c) A certification that any of the items in paragraph (a) of this provision exists will not necessarily result in withholding of an award under this solicitation. However, the certification will be considered in connection with a determination of the Offeror's responsibility. Failure of the Offeror to furnish a certification or provide such additional information as requested by the Contracting Officer may render the Offeror nonresponsible.

(d) Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render, in good faith, the certification required by paragraph (a) of this provision. The knowledge and information of an Offeror is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

(e) The certification in paragraph (a) of this provision is a material representation of fact upon which reliance was placed when making award. If it is later determined that the Offeror knowingly rendered an erroneous certification, in addition to other remedies available to the Government, the Contracting Officer may terminate the contract resulting from this solicitation for default.

13. FAR 52.214-2 TYPE OF BUSINESS ORGANIZATION--SEALED BIDDING
(JUL 1987)

The bidder, by checking the applicable box, represents that--

(a) It operates as ☐ a corporation incorporated under the laws of the State of _____, ☐ an individual, ☐ a partnership, ☐ a nonprofit organization, or ☐ a joint venture; or

(b) If the bidder is a foreign entity, it operates as ☐ an individual, ☐ a partnership, ☐ a nonprofit organization, ☐ a joint venture, or ☐ a corporation, registered for business in _____. (country)

16. FAR 52.219-1 SMALL BUSINESS PROGRAM REPRESENTATION (JAN 1997)

(a)(1) The standard industrial classification (SIC) code for this acquisition is 1629 - Heavy Construction, Except Dredging, Not Elsewhere Classified.

(2) The small business size standard is \$17,000,000

(3) The small business size standard for a concern which submits an offer in its own name, other than on a construction or service contract, but which proposes to furnish a product which it did not itself manufacture, is 500 employees.

(b) Representations. (1) The offeror represents as part of its offer that it / / is, / / is not a small business concern.

(2) (Complete only if offeror represented itself as a small business concern in block (b)(1) of this section.) The offeror represents as part of its offer that it / / is, / / is not a women-owned small business concern.

(c) Definitions. "Joint venture," for purposes of a small disadvantaged business (SDB) set-aside or price evaluation preference (as prescribed at 13 CFR 124.321), is a concern that is owned and controlled by one or more socially and economically disadvantaged individuals entering into a joint venture agreement with one or more business concerns and is considered to be affiliated for size purposes with such other concern(s). The combined annual receipts or employees of the concerns entering into the joint venture must meet the applicable size standard corresponding to the SIC code designated for the contract. The majority of the venture's earnings must accrue directly to the socially and economically disadvantaged individuals in the SDB concerns(s) in the joint venture. The percentage of the ownership involvement in a joint venture by disadvantaged individuals must be at least 51 percent.

"Small business concern," as used in this provision, means a concern, including its affiliates, that is independently owned and operated, not dominant in the field of operation in which it is bidding on Government contracts, and qualified as a small business under the criteria in 13 CFR Part 121 and the size standard in paragraph (a) of this provision.

"Small disadvantaged business concern," as used in this provision, means a small business concern that (1) is at least 51 percent unconditionally owned by one or more individuals who are both socially and economically disadvantaged, or a publicly owned business having at least 51 percent of its stock unconditionally owned by one or more socially and economically disadvantaged individuals, and (2) has its management and daily business controlled by one or more such individuals. This term also means a small business concern that is at least 51 percent unconditionally owned by an economically disadvantaged Indian tribe or Native Hawaiian Organization, or a publicly owned business having at least 51 percent of its stock unconditionally owned by one or more of these entities, which has its management and daily business controlled by members of an economically disadvantaged Indian tribe or Native Hawaiian Organization, and which meets the requirements of 13 CFR Part 124.

"Women-owned small business concern," as used in this provision, means a small business concern--

(1) Which is at least 51 percent owned by one or more women or, in the case of any publicly owned business, at least 51 percent of the stock of which is owned by one or more women; and

(2) Whose management and daily business operations are controlled by one or more women.

(d) Notice. (1) If this solicitation is for supplies and has been set aside, in whole or in part, for small business concerns, then the clause in this solicitation providing notice of the set-aside contains restrictions on the source of the end items to be furnished.

(2) Under 15 U.S.C. 645(d), any person who misrepresents a firm's status as a small or small disadvantaged business concern in order to obtain a contract to be awarded under the preference programs established pursuant to sections 8(a), 8(d), 9, or 15 of the Small Business Act or any other provision of Federal law that specifically references section 8(d) for a definition of program eligibility, shall--

(i) Be punished by imposition of a fine, imprisonment, or both;

(ii) Be subject to administrative remedies, including suspension and debarment; and

(iii) Be ineligible for participation in programs conducted under the authority of the Act.

14. FAR 52.219-2

EQUAL LOW BIDS (OCT 1995)

(a) This provision applies to small business concerns only.

(b) The bidder's status as a labor surplus area (LSA) concern may affect entitlement to award in case of tie bids. If the bidder wishes to be

considered for this priority, the bidder must identify, in the following space, the LSA in which the costs to be incurred on account of manufacturing or production (by the bidder of the first-tier subcontractors) amount to more than 50 percent of the contract price.

(c) Failure to identify the labor surplus areas as specified in paragraph (b) of this provision will preclude the bidder from receiving priority consideration. If the bidder is awarded a contract as a result of receiving priority consideration under this provision and would not have otherwise received award, the bidder shall perform the contract or cause the contract to be performed in accordance with the obligations of an LSA concern.

15. FAR 52.219-19 SMALL BUSINESS CONCERN REPRESENTATION FOR THE
SMALL BUSINESS COMPETITIVENESS DEMONSTRATION
PROGRAM (JAN 1997)

(a) Definition.

"Emerging small business" as used in this solicitation, means a small business concern whose size is no greater than 50 percent of the numerical size standard applicable to the standard industrial classification code assigned to a contracting opportunity.

(b) (Complete only if the Offeror has represented itself under the provision at 52.219-1 as a small business concern under the size standards of this solicitation.)

The Offeror represents and certifies as part of its offer that it /___/ is, /___/ is not an emerging small business.

(c) (Complete only if the Offeror is a small business or an emerging small business, indicating its size range.)

Offeror's number of employees for the past 12 months (check this column if size standard stated in solicitation is expressed in terms of number of employees) or Offeror's average annual gross revenue for the last 3 fiscal years (check this column if size standard stated in solicitation is expressed in terms of annual receipts). (Check one of the following.)

No. of Employees	Avg. Annual Gross Revenues
___ 50 or fewer	___ \$1 million or less
___ 51-100	___ \$1,000,001-\$2 million
___ 101-250	___ \$2,000,001-\$3.5 million
___ 251-500	___ \$3,500,001-\$5 million
___ 501-750	___ \$5,000,001-\$10 million
___ 751-1,000	___ \$10,000,001-\$17 million
___ Over 1,000	___ Over \$17 million

16. DFARS 252.219-7000 SMALL DISADVANTAGED BUSINESS CONCERN
REPRESENTATION (DOD CONTRACTS
(APR 1994)

(a) Definition. "Small disadvantaged business concern," as used in this provision, means a small business concern, owned and controlled by individuals who are both socially and economically disadvantaged, as defined by the Small Business Administration at 13 CFR Part 124, the majority of earnings of which directly accrue to such individuals. This term also means a small business concern owned and controlled by an economically disadvantaged Indian tribe or Native Hawaiian organization which meets the requirements of 13 CFR 124.112 or

13 CFR 124.113, respectively. In general, 13 CFR Part 124 describes a small disadvantaged business concern as a small business concern--

(1) Which is at least 51 percent unconditionally owned by one or more socially and economically disadvantaged individuals; or

(2) In the case of any publicly owned business, at least 51 percent of the voting stock is unconditionally owned by one or more socially and economically disadvantaged individuals; and

(3) Whose management and daily business operations are controlled by one or more such individuals.

(b) Representations. Check the category in which your ownership falls--
 _____ Subcontinent Asian (Asian-Indian) American (U.S. citizen with origins from India, Pakistan, Bangladesh, Sri Lanka, Bhutan, or Nepal)

_____ Asian-Pacific American (U.S. citizen with origins from Japan, China, the Philippines, Vietnam, Korea, Samoa, Guam, U.S. Trust Territory of the Pacific Islands (Republic of Palau), the Northern Mariana Islands, Laos, Kampuchea (Cambodia), Taiwan, Burma, Thailand, Malaysia, Indonesia, Singapore, Brunei, Republic of the Marshall Islands, or the Federated States of Micronesia)

_____ Black American (U.S. citizen)

_____ Hispanic American (U.S. citizen with origins from South America, Central America, Mexico, Cuba, the Dominican Republic, Puerto Rico, Spain, or Portugal)

_____ Native American (American Indians, Eskimos, Aleuts, or Native Hawaiians, including Indian tribes or Native Hawaiian organizations)

_____ Individual/concern, other than one of the preceding, currently certified for participation in the Minority Small Business and Capital Ownership Development Program under Section 8(a) of the Small Business Act

_____ Other

(c) Certifications. Complete the following--

(1) The offeror is _____ is not _____ a small disadvantaged business concern.

(2) The Small Business Administration (SBA) has _____ has not _____ made a determination concerning the offeror's status as a small disadvantaged business concern. If the SBA has made a determination, the date of the determination was _____ and the offeror--

_____ Was found by SBA to be socially and economically disadvantaged and no circumstances have changed to vary that determination.

_____ Was found by SBA not to be socially and economically disadvantaged but circumstances which caused the determination have changed.

(d) Penalties and Remedies. Anyone who misrepresents the status of a concern as a small disadvantaged business for the purpose of securing a contract or subcontract shall--

(1) Be punished by imposition of a fine, imprisonment, or both;

(2) Be subject to administrative remedies, including suspension and debarment; and

(3) Be ineligible for participation in programs conducted under authority of the Small Business Act.

17. FAR 52.222-22

PREVIOUS CONTRACTS AND COMPLIANCE REPORTS
(APR 1984)

The offeror represents that--

(a) It /_/ has, /_/ has not, participated in a previous contract or subcontract subject either to the Equal Opportunity clause of this solicitation, the clause originally contained in Section 310 of Executive Order No. 10925, or the clause contained in Section 201 of Executive Order No. 11114;

(b) It /_/ has, /_/ has not, filed all required compliance reports; and

(c) Representations indicating submission of required compliance reports, signed by proposed subcontractors, will be obtained before subcontract awards.

18. FAR 52.223-1

CLEAN AIR AND WATER CERTIFICATION
(APR 1984)

The Offeror certifies that--

(a) Any facility to be used in the performance of this proposed contract is /_/ is not /_/ listed on the Environmental Protection Agency (EPA) List of Violating Facilities;

(b) The Offeror will immediately notify the Contracting Officer, before award, of the receipt of any communication from the Administrator, or a designee, of the EPA, indicating that any facility that the Offeror proposes to use for the performance of the contract is under consideration to be listed on the EPA List of Violating Facilities; and

(c) The Offeror will include a certification substantially the same as this certification, including this paragraph (c), in every nonexempt subcontract.

19. FAR 52.223-3

HAZARDOUS MATERIAL IDENTIFICATION AND MATERIAL
SAFETY DATA (JAN 1997)

(a) "Hazardous material," as used in this clause, includes any material defined as hazardous under the latest version of Federal Standard No. 313 (including revisions adopted during the term of the contract).

(b) The Offeror must list any hazardous material, as defined in paragraph (a) of this clause, to be delivered under this contract. The hazardous material shall be properly identified and include any applicable identification number, such as National Stock Number or Special Item Number. This information shall also be included on the Material Safety Data Sheet submitted under this contract.

Material
(If none, insert None)

Identification No.

_____	_____
_____	_____
_____	_____

(c) This list must be updated during performance of the contract whenever the Contractor determines that any other material to be delivered under this contract is hazardous.

(d) The apparently successful Offeror agrees to submit, for each item as required prior to award, a Material Safety Data Sheet, meeting the requirements of 29 CFR 1910.1200(g) and the latest version of Federal Standard No. 313, for all hazardous material identified in paragraph (b) of this clause. Data shall be submitted in accordance with Federal Standard No. 313, whether or not the apparently successful Offeror is the actual manufacturer of these items. Failure to submit the Material Safety Data Sheet prior to award may result in the apparently successful Offeror being considered nonresponsible and ineligible for award.

(e) If, after award, there is a change in the composition of the item(s) or a revision to Federal Standard No. 313, which renders incomplete or inaccurate the data submitted under paragraph (d) of this clause or the certification submitted under paragraph (c) of this clause, the Contractor shall promptly notify the Contracting Officer and resubmit the data.

(f) Neither the requirements of this clause nor any act or failure to act by the Government shall relieve the Contractor of any responsibility or liability for the safety of Government, Contractor, or subcontractor personnel or property.

(g) Nothing contained in this clause shall relieve the Contractor from complying with applicable Federal, State, and local laws, codes, ordinances, and regulations (including the obtaining of licenses and permits) in connection with hazardous material.

(h) The Government's rights in data furnished under this contract with respect to hazardous material are as follows:

(1) To use, duplicate and disclose any data to which this clause is applicable. The purposes of this right are to--

(i) Apprise personnel of the hazards to which they may be exposed in using, handling, packaging, transporting, or disposing of hazardous materials;

(ii) Obtain medical treatment for those affected by the material; and

(iii) Have others use, duplicate, and disclose the data for the Government for these purposes.

(2) To use, duplicate, and disclose data furnished under this clause, in accordance with subparagraph (h)(1) of this clause, in precedence over any other clause of this contract providing for rights in data.

(3) The Government is not precluded from using similar or data acquired from other sources.

20. FAR 52.223-13

CERTIFICATION OF TOXIC CHEMICAL RELEASE REPORTING (OCT 1996)

(a) Submission of this certification is a prerequisite for making or entering into this contract imposed by Executive Order 12969, August 8, 1995.

(b) By signing this offer, the offeror certifies that--

(1) As the owner or operator of facilities that will be used in for performance of this contract that are subject to the filing and reporting requirements described in section 3123 of the Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA) (42 U.S.C. 11023) and section 6607 of the Pollution Prevention Act of 1990 (PPA) (42 U.S.C. 13106), the offeror will file and continue to file for such facilities for the life of the contract the Toxic Chemical Release Inventory Form (Form R) as described in sections 313(a) and (g) of the EPCRA and section 6607 of PPA; or

(2) None of its owned or operated facilities to be used in the performance of this contract is subject to the Form R filing and reporting requirements because each such facility is exempt for at least one of the following reasons: (Check each block that is applicable.)

() (i) The facility does not manufacture, process, or otherwise use any toxic chemicals listed under section 313(c) of EPCRA, 42 U.S.C. 11023(c);

() (ii) The facility does not have 10 or more full-time employees as specified in section 313(b)(1)(A) of EPCRA, 42 U.S.C. 11023(b)(1)(A);

() (iii) The facility does not meet the reporting thresholds of toxic chemicals established under section 313(f) of EPCRA, 42 U.S.C. 11023(f) (including the alternate thresholds at 40 CFR 372.27, provided an appropriate certification form has been filed with EPA);

() (iv) The facility does not fall within Standard Industrial Classification Code (SIC) designations 20 through 39 as set forth in section 19.102 of the Federal Acquisition Regulation; or

() (v) The facility is not located within any State of the United States, the District of Columbia, the Commonwealth of Puerto Rico, Guam, American Samoa, the United States Virgin Islands, the Northern Mariana Islands, or any other territory or possession over which the United States has jurisdiction.

21. DFARS 252.223-7001

HAZARD WARNING LABELS (DEC 1991)

(a) "Hazardous material," as used in this clause, is defined in the Hazardous Material Identification and Material Safety Data clause of this contract.

(b) The Contractor shall label the item package (unit container) of any hazardous material to be delivered under this contract in accordance with the Hazard Communication Standard (29 CFR 1910.1200 et seq.). The Standard requires that the hazard warning label conform to the requirements of the standard unless the material is otherwise subject to the labeling requirements of one of the following statutes:

(1) Federal Insecticide, Fungicide and Rodenticide Act;

(2) Federal Food, Drug and Cosmetics Act;

- (3) Consumer Product Safety Act;
- (4) Federal Hazardous Substances Act; or
- (5) Federal Alcohol Administration Act.

(c) The Offeror shall list which hazardous material listed in the Hazardous Material Identification and Material Safety Data clause of this contract will be labeled in accordance with one of the Acts in paragraphs (b)(1) through (5) of this clause instead of the Hazard Communication Standard. Any hazardous material not listed will be interpreted to mean that a label is required in accordance with the Hazard Communication Standard.

Material (if none, insert "none.")	Act
_____	_____
_____	_____
_____	_____

(d) The apparently successful Offeror agrees to submit, before award, a copy of the hazard warning label for all hazardous materials not listed in paragraph (c) of this clause. The Offeror shall submit the label with the Material Safety Data Sheet being furnished under the Hazardous Material Identification and Material Safety Data clause of this contract.

(e) The Contractor shall also comply with MIL-STD-129, Marking for Shipment and Storage (including revisions adopted during the term of this contract).

22. 52.225-7006

BUY AMERICAN ACT--TRADE AGREEMENTS--BALANCE OF
PAYMENTS PROGRAM CERTIFICATE (JAN 1994)
(APPLICABLE IF DFARS 252.225-7007 APPLIES - SEE
SECTION 00700)

(a) Definitions.

'Caribbean Basin country end product,' 'designated country end product,' 'domestic end product,' 'NAFTA country end product,' 'nondesignated country end product,' 'qualifying country end product,' and 'U.S. made end product' have the meanings given in the Trade Agreements or Buy American Act and Balance of Payments Program clauses of this solicitation.

(b) Evaluation.

Offers will be evaluated by giving preference to U.S. made end products, qualifying country end products, designated country end products, NAFTA country end products, and Caribbean Basin country end products over other end products.

(c) Certifications.

(1) The Offeror certifies that--

(i) Each end product, except the end products listed in paragraph (c)(2) of this provision, is a domestic end product (as defined in the Buy American Act and Balance of Payments Program clause of this solicitation); and

(ii) Components of unknown origin are considered to have been mined, produced, or manufactured outside the United States or a qualifying country.

(2) The Offeror must identify and certify all end products that are not domestic end products.

(i) The Offeror certifies that the following supplies qualify as 'U.S. made end products' but do not meet the definition of 'domestic end product':

(Insert line item number)

(ii) The Offeror certifies that the following supplies are qualifying country end products:

(Insert line item number)

(Insert country of origin)

(iii) The Offeror certifies that the following supplies qualify as designated country end products:

(Insert line item number)

(Insert country of origin)

(iv) The Offeror certifies that the following supplies qualify as Caribbean Basin country end products:

(Insert line item number)

(Insert country of origin)

(v) The Offeror certifies that the following supplies qualify as NAFTA country end products:

(Insert line item number)

(Insert country of origin)

(vi) The Offeror certifies that the following supplies are other nondesignated country end products:

(Insert line item number)

(Insert country of origin)

23. DFARS 252.225-7035 BUY AMERICAN ACT--NORTH AMERICAN FREE TRADE AGREEMENT IMPLEMENTATION ACT--BALANCE OF PAYMENTS PROGRAM CERTIFICATE (MAY 1995) (APPLICABLE IF DFARS 252.225-7036 APPLIES - SEE SECTION 00700)

(a) Definitions.

"Domestic end product," "qualifying country end product," and "U.S. made end product" have the meanings given in the North American Free Trade Agreement Implementation Act or Buy American Act and Balance of Payments Program clauses of this solicitation.

(b) Evaluation.

Offers will be evaluated by giving preference to U.S. made end products, qualifying country end products, or NAFTA country end products over other end products.

(c) Certifications.

(1) The Offeror certifies that--

(i) Each end product, except the end products listed in paragraph (c)(2) of this provision, is a domestic end product (as defined in the Buy American Act and Balance of Payments Program clause of this solicitation); and

(ii) Components of unknown origin are considered to have been mined, produced, or manufactured outside the United States or a qualifying country.

(2) The Offeror must identify and certify all end products that are not domestic end products.

(i) The Offeror certifies that the following supplies qualify as "U.S. made end products" but do not meet the definition of "domestic end product":

(Insert line item number)

(ii) The Offeror certifies that the following supplies are qualifying country (except Canada) end products:

(Insert line item number)

(Insert country of origin)

(iii) The Offeror certifies that the following supplies qualify as NAFTA country end products:

(Insert Line item number)

(Insert country of origin)

(iv) The Offeror certifies that the following supplies are other non-NAFTA country end products:

(Insert Line item number)

(Insert country of origin)

24. DFARS 252.247-7022 REPRESENTATION OF EXTENT OF TRANSPORTATION BY
SEA (AUG 1992)

(a) The Offeror shall indicate by checking the appropriate blank in paragraph (b) of this provision whether transportation of supplies by sea is anticipated under the resultant contract. The term supplies is defined in the Transportation of Supplies by Sea clause of this solicitation.

(b) Representation.

The Offeror represents that it--

_____ Does anticipate that supplies will be transported by sea in the performance of any contract or subcontract resulting from this solicitation.

_____ Does not anticipate that supplies will be transported by sea in the performance of any contract or subcontract resulting from this solicitation.

(c) Any contract resulting from this solicitation will include the Transportation of Supplies by Sea clause. If the Offeror represents that it will not use ocean transportation, the resulting contract will also include the Defense FAR Supplement clause at 252.247-7024, Notification of Transportation of Supplies by Sea.

END OF SECTION

SECTION 00700
CONSTRUCTION CONTRACT CLAUSES

SECTION 00700

CONTRACT CLAUSES

1. FAR 52.252-2 CLAUSES INCORPORATED BY REFERENCE (JUN 1988)

This solicitation incorporates one or more clauses by reference, with the same force and effect as if they were given in full text. Upon request, the Contracting Officer will make their full text available.

CONTRACT CLAUSES BY REFERENCE:

2. DFARS 252.201-7000 CONTRACTING OFFICER'S REPRESENTATIVE (DEC 1991)
3. FAR 52.202-1 I DEFINITIONS (OCT 1995)--ALTERNATE I (APR 1984)
4. FAR 52.203-3 GRATUITIES (APR 1984)
5. FAR 52.203-5 COVENANT AGAINST CONTINGENT FEES (APR 1984)
6. FAR 52.203-6 RESTRICTIONS ON SUBCONTRACTOR SALES TO THE GOVERNMENT (JUL 1995)
7. FAR 52.203-7 ANTI-KICKBACK PROCEDURES (JUL 1995)
8. FAR 52.203-10 PRICE OR FEE ADJUSTMENT FOR ILLEGAL OR IMPROPER ACTIVITY (JAN 1997)
9. FAR 52.203-12 LIMITATION ON PAYMENTS TO INFLUENCE CERTAIN FEDERAL TRANSACTIONS (JAN 1990)
(APPLICABLE OVER \$100,000)
10. DFARS 252.203-7000 STATUTORY PROHIBITION ON COMPENSATION TO FORMER DEPARTMENT OF DEFENSE EMPLOYEES (NOV 1995)
(APPLICABLE OVER \$100,000)
11. DFARS 252.203-7001 SPECIAL PROHIBITION ON EMPLOYMENT (NOV 1995)
12. DFARS 252.203-7002 DISPLAY OF DOD HOTLINE POSTER (DEC 1991)
(APPLICABLE OVER \$5 MILLION)
13. FAR 52.204-2 II SECURITY REQUIREMENTS (APR 1984)--ALTERNATE II (APR 1984)
(APPLICABLE IF CONTRACTOR HAS ACCESS TO CLASSIFIED INFORMATION)
14. DFARS 252.204-7000 DISCLOSURE OF INFORMATION (DEC 1991)
(APPLICABLE IF CONTRACTOR HAS ACCESS TO INFORMATION INAPPROPRIATE FOR RELEASE)
15. DFARS 252.205-7000 PROVISION OF INFORMATION TO COOPERATIVE AGREEMENT HOLDERS (DEC 1991)
(APPLICABLE OVER \$500,000)
16. FAR 52.209-6 PROTECTING THE GOVERNMENT'S INTEREST WHEN SUBCONTRACTING WITH CONTRACTORS DEBARRED, SUSPENDED OR PROPOSED FOR DEBARMENT (JUL 1995)
17. DFARS 252.209-7000 ACQUISITION FROM SUBCONTRACTORS SUBJECT TO ON-SITE INSPECTION UNDER THE INTERMEDIATE-RANGE NUCLEAR FORCES (INF) TREATY (NOV 1995)

18. DFARS 252.209-7004 REPORTING OF COMMERCIAL TRANSACTIONS WITH THE
GOVERNMENT OF A TERRORIST COUNTRY (SEP 1994)
(APPLICABLE OVER \$5,000,000)
19. FAR 52.211-15 DEFENSE PRIORITY AND ALLOCATION REQUIREMENTS
(SEP 1990)
20. FAR 52.211-18 VARIATION IN ESTIMATED QUANTITY (APR 1984)
(APPLICABLE IF THERE ARE ESTIMATED-QUANTITY LINE
ITEMS IN PRICING SCHEDULE)
21. FAR 52.214-26 AUDIT AND RECORDS--SEALED BIDDING (OCT 1995)
(APPLICABLE IF SEALED BIDDING - SEE BLOCK 2,
SF1442 - AND OVER \$500,000)
22. FAR 52.214-27 PRICE REDUCTION FOR DEFECTIVE COST OR PRICING
DATA-MODIFICATIONS-SEALED BIDDING (OCT 1995)
(APPLICABLE IF SEALED BIDDING - SEE BLOCK 2,
SF1442 - AND OVER \$500,000)
23. FAR 52.214-28 SUBCONTRACTOR COST OR PRICING DATA--
MODIFICATIONS--SEALED BIDDING (OCT 1995)
(APPLICABLE IF SEALED BIDDING - SEE BLOCK 2,
SF1442 - AND OVER \$500,000)
24. FAR 52.214-29 ORDER OR PRECEDENCE--SEALED BIDDING (JAN 1986)
(APPLICABLE IF SEALED BIDDING - SEE BLOCK 2,
SF1442)
25. FAR 52.215-2 AUDIT AND RECORDS--NEGOTIATION (AUG 1996)
(APPLICABLE IF CONTRACTING BY NEGOTIATIONS)
26. FAR 52.215-22 PRICE REDUCTION FOR DEFECTIVE COST OR PRICING
DATA (OCT 1995)
(APPLICABLE IF CONTRACTING BY NEGOTIATIONS AND
CERTIFIED COST OR PRICING DATA IS REQUIRED)
27. FAR 52.215-24 SUBCONTRACTOR COST OR PRICING DATA (OCT 1995)
(APPLICABLE FAR 52.215-22 APPLIES)
28. FAR 52.215-27 TERMINATION OF DEFINED BENEFIT PENSION PLANS
(MAR 1996)
(APPLICABLE IF CERTIFIED COST OR PRICING DATA IS
REQUIRED AND FOR WHICH ANY PREAWARD OR POSTAWARD
COST DETERMINATIONS WILL BE SUBJECT TO FAR
SUBPART 31.2)
29. FAR 52.215-31 WAIVER OF FACILITIES CAPITAL COST OF MONEY (SEP
1987)
(APPLICABLE ANY TIME THE COST PRINCIPLES OF FAR
31.2 APPLY - MODIFICATIONS - AND ORIGINAL
BID/OFFER DID NOT INCLUDE FACILITIES CAPITAL
COST OF MONEY)
30. FAR 52.215-33 ORDER OF PRECEDENCE (JAN 1986)
(APPLICABLE IF NEGOTIATED - SEE BLOCK 2, SF
1442)

- 31. FAR 52.215-39 REVERSION OR ADJUSTMENT OF PLANS FOR POSTRETIREMENT BENEFITS (PRB) OTHER THAN PENSIONS (MAR 1996)
(APPLICABLE IF CERTIFIED COST OR PRICING DATA WILL BE REQUIRED OR FOR WHICH ANY PREAWARD OR POSTAWARD COST DETERMINATIONS WILL BE SUBJECT TO FAR SUBPART 31.2)
- 32. FAR 52.215-40 NOTIFICATION OF OWNERSHIP CHANGES (FEB 1995)
(APPLICABLE IF CERTIFIED COST OR PRICING DATA WILL BE REQUIRED OR FOR WHICH ANY PREAWARD OR POSTAWARD COST DETERMINATIONS WILL BE SUBJECT TO FAR SUBPART 31.2)
- 33. DFARS 252.215-7000 PRICING ADJUSTMENTS (DEC 1991)
(APPLICABLE IF FAR 52.215-24 APPLIES)
- 34. DFARS 252.215-7002 COST ESTIMATING SYSTEM REQUIREMENTS (DEC 1991)
(APPLICABLE IF NEGOTIATED - SEE BLOCK 2, SF 1442 - AND CONTRACT AWARD IS MADE ON THE BASIS OF CERTIFIED COST OR PRICING DATA)
- 35. FAR 52.219-6 NOTICE OF TOTAL SMALL BUSINESS SET-ASIDE (JUL 1996)
(APPLICABLE IF SET ASIDE FOR SMALL BUSINESS - SEE DD FORM 1707)
- 36. FAR 52.219-8 UTILIZATION OF SMALL, SMALL DISADVANTAGED AND WOMEN-OWNED SMALL BUSINESS CONCERNS (OCT 1995)
- 37. FAR 52.219-16 LIQUIDATED DAMAGES--SUBCONTRACTING PLAN (OCT 1995)
(APPLICABLE IF FAR 52.219-9 IS APPLICABLE)
- 38. DFARS 252.219-7003 SMALL, SMALL DISADVANTAGED AND WOMEN-OWNED SMALL BUSINESS SUBCONTRACTING PLAN (DOD CONTRACTS) (APR 1996)
(APPLICABLE IF FAR 52.219-9 IS APPLICABLE)
- 39. FAR 52.222-3 CONVICT LABOR (AUG 1996)
- 40. FAR 52.222-4 CONTRACT WORK HOURS AND SAFETY STANDARDS ACT-OVERTIME COMPENSATION (JUL 1995)
- 41. FAR 52.222-6 DAVIS-BACON ACT (FEB 1995)
- 42. FAR 52.222-7 WITHHOLDING OF FUNDS (FEB 1988)
- 43. FAR 52.222-8 PAYROLLS AND BASIC RECORDS (FEB 1988)
- 44. FAR 52.222-9 APPRENTICES AND TRAINEES (FEB 1988)
- 45. FAR 52.222-10 COMPLIANCE WITH COPELAND ACT REQUIREMENTS (FEB 1988)
- 46. FAR 52.222-11 SUBCONTRACTS (LABOR STANDARDS) (FEB 1988)
- 47. FAR 52.222-12 CONTRACT TERMINATION--DEBARMENT (FEB 1988)
- 48. FAR 52.222-13 COMPLIANCE WITH DAVIS-BACON AND RELATED ACT REGULATIONS (FEB 1988)

- 49. FAR 52.222-14 DISPUTES CONCERNING LABOR STANDARDS (FEB 1988)
- 50. FAR 52.222-15 CERTIFICATION OF ELIGIBILITY (FEB 1988)
- 51. FAR 52.222-26 EQUAL OPPORTUNITY (APR 1984)
- 52. FAR 52.222-27 AFFIRMATIVE ACTION COMPLIANCE REQUIREMENTS FOR CONSTRUCTION (APR 1984)
- 53. FAR 52.222-35 AFFIRMATIVE ACTION FOR SPECIAL DISABLED AND VIETNAM ERA VETERANS (APR 1984)
- 54. FAR 52.222-36 AFFIRMATIVE ACTION FOR HANDICAPPED WORKERS (APR 1984)
- 55. FAR 52.222-37 EMPLOYMENT REPORTS ON SPECIAL DISABLED VETERANS AND VETERANS OF THE VIETNAM ERA (JAN 1988)
- 56. FAR 52.223-2 CLEAN AIR AND WATER (APR 1984)
(APPLICABLE OVER \$100,000 AND THE ANSWER TO SECTION 00600, 52.223-1, IS YES)
- 57. FAR 52.223-6 DRUG-FREE WORKPLACE (JAN 1997)
- 58. DFARS 252.223-7002 SAFETY PRECAUTIONS FOR AMMUNITION AND EXPLOSIVES (MAY 1994)
(APPLICABLE IF EXPLOSIVES ARE USED)
- 59. DFARS 252.223-7003 CHANGE IN PLACE OF PERFORMANCE--AMMUNITION AND EXPLOSIVES (DEC 1991)
(APPLICABLE IF EXPLOSIVES ARE USED)
- 60. FAR 52.225-11 RESTRICTIONS ON CERTAIN FOREIGN PURCHASES (OCT 1996)
- 61. DFARS 252.225-7007 TRADE AGREEMENTS ACT (JAN 1996)
(APPLICABLE IF CONTRACT AMOUNT IS \$182,000 OR OVER EXCEPT WHEN SMALL OR SMALL, DISADVANTAGED BUSINESS PREFERENCE PROGRAM APPLIES TO THIS ACQUISITION)
- 62. DFARS 252.225-7008 SUPPLIES TO BE ACCORDED DUTY-FREE ENTRY (DEC 1991)
- 63. DFARS 252.225-7009 DUTY-FREE ENTRY--QUALIFYING COUNTRY END PRODUCTS AND SUPPLIES (DEC 1991)
- 64. DFARS 252.225-7012 PREFERENCE FOR CERTAIN DOMESTIC COMMODITIES (NOV 1995)
- 65. DFARS 252.225-7026 REPORTING OF CONTRACT PERFORMANCE OUTSIDE THE UNITED STATES (NOV 1995)
(APPLICABLE OVER \$500,000)
- 66. DFARS 252.225-7036 NORTH AMERICAN FREE TRADE AGREEMENT IMPLEMENTATION ACT (JAN 1994)
(APPLICABLE IF CONTRACT AMOUNT IS \$6,500,000 OR OVER EXCEPT WHEN SMALL OR SMALL, DISADVANTAGED BUSINESS PREFERENCE PROGRAM APPLIES TO THIS ACQUISITION)
- 67. DFARS 252.225-7037 DUTY-FREE ENTRY--NAFTA COUNTRY END PRODUCTS AND SUPPLIES (JAN 1994)

- (APPLICABLE IF DFARS 252.225-7036 APPLIES - SEE ABOVE)
- 68. FAR 52.226-1 UTILIZATION OF INDIAN ORGANIZATIONS AND INDIAN-OWNED ECONOMIC ENTERPRISES (SEP 1996)
(APPLICABLE IF FAR 52.219-9 IS APPLICABLE)
 - 69. FAR 52.227-1 AUTHORIZATION AND CONSENT (JUL 1995)
 - 70. FAR 52.227-4 PATENT INDEMNITY--CONSTRUCTION CONTRACTS (APR 1984)
 - 71. FAR 52.227-11 PATENT RIGHTS--RETENTION BY THE CONTRACTOR (SHORT FORM) (JUN 1989)
(APPLICABLE IF NONSTANDARD WORK AND SMALL BUSINESS - SEE FAR 27.304-3)
 - 72. FAR 52.227-12 PATENT RIGHTS--RETENTION BY THE CONTRACTOR (LONG FORM) (JAN 1997)
(APPLICABLE IF NONSTANDARD WORK AND LARGE BUSINESS - SEE FAR 27.304-3)
 - 73. DFARS 252.227-7000 NON-ESTOPPEL (OCT 1966)
 - 74. DFARS 252.227-7022 GOVERNMENT RIGHTS (UNLIMITED) (MAR 1979)
(APPLICABLE TO CONSTRUCTION INVOLVING DESIGN SERVICES)
 - 75. DFARS 252.227-7023 DRAWINGS AND OTHER DATA TO BECOME PROPERTY OF GOVERNMENT (MAR 1979)
(APPLICABLE TO CONSTRUCTION INVOLVING DESIGN SERVICES)
 - 76. DFARS 252.227-7024 NOTICE AND APPROVAL OF RESTRICTED DESIGNS (APR 1984)
(APPLICABLE TO CONSTRUCTION INVOLVING DESIGN SERVICES)
 - 77. DFARS 252.227-7033 RIGHTS IN SHOP DRAWINGS (APR 1966)
 - 78. DFARS 252.227-7034 PATENTS--SUBCONTRACTS (APR 1984)
 - 79. DFARS 252.227-7039 PATENTS--REPORTING OF SUBJECT INVENTIONS (APR 1990)
(APPLICABLE IF FAR 52.227-11 ABOVE IS APPLICABLE)
 - 80. FAR 52.228-1 BID GUARANTEE (SEP 1996)
 - 81. FAR 52.228-2 ADDITIONAL BOND SECURITY (APR 1984)
 - 82. FAR 52.228-11 PLEDGES OF ASSETS (FEB 1992)
 - 83. FAR 52.229-3 FEDERAL, STATE, AND LOCAL TAXES (JAN 1991)
 - 84. FAR 52.229-5 TAXES--CONTRACTS PERFORMED IN U.S. POSSESSIONS OR PUERTO RICO (APR 1984)
 - 85. DFARS 252.231-7000 SUPPLEMENTAL COST PRINCIPLES (DEC 1991)
 - 86. FAR 52.232-5 PAYMENTS UNDER FIXED-PRICE CONSTRUCTION CONTRACTS (MAY 1997)

87.	FAR 52.232-17	INTEREST (JUN 1996)
88.	FAR 52.232-23 I	ASSIGNMENT OF CLAIMS (JAN 1986)--ALTERNATE I (APR 1984)
89.	FAR 52.233-1	DISPUTES (OCT 1995)
90.	FAR 52.233-3	PROTEST AFTER AWARD (OCT 1995)
91.	DFARS 252.233-7000	CERTIFICATION OF CLAIMS AND REQUESTS FOR ADJUSTMENT OR RELIEF (MAY 1994) (APPLICABLE OVER \$100,000)
92.	FAR 52.236-2	DIFFERING SITE CONDITIONS (APR 1984)
93.	FAR 52.236-3	SITE INVESTIGATION AND CONDITIONS AFFECTING THE WORK (APR 1984)
94.	FAR 52.236-5	MATERIALS AND WORKMANSHIP (APR 1984)
95.	FAR 52.236-6	SUPERINTENDENCE BY THE CONTRACTOR (APR 1984)
96.	FAR 52.236-7	PERMITS AND RESPONSIBILITIES (NOV 1991)
97.	FAR 52.236-8	OTHER CONTRACTS (APR 1984)
98.	FAR 52.236-9	PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES, AND IMPROVEMENTS (APR 1984)
99.	FAR 52.236-10	OPERATIONS AND STORAGE AREAS (APR 1984)
100.	FAR 52.236-11	USE AND POSSESSION PRIOR TO COMPLETION (APR 1984)
101.	FAR 52.236-12	CLEANING UP (APR 1984)
102.	FAR 52.236-13 I	ACCIDENT PREVENTION (NOV 1991)--ALTERNATE I (NOV 1991)
103.	FAR 52.236-15	SCHEDULES FOR CONSTRUCTION CONTRACTS (APR 1984) (APPLICABLE IF PERFORMANCE PERIOD EXCEEDS 60 DAYS)
104.	FAR 52.236-17	LAYOUT OF WORK (APR 1984)
105.	FAR 52.236-21 I	SPECIFICATIONS AND DRAWINGS FOR CONSTRUCTION (FEB 1997)--ALTERNATE I (APR 1984)
106.	DFARS 252.236-7000	MODIFICATION PROPOSALS--PRICE BREAKDOWN (DEC 1991)
107.	DFARS 252.236-7008	CONTRACT PRICES-BIDDING SCHEDULES (DEC 1991) (APPLICABLE IF THERE ARE UNIT PRICES)
108.	FAR 52.242-13	BANKRUPTCY (JUL 1995)
109.	FAR 52.242-14	SUSPENSION OF WORK (APR 1984)
110.	DFARS 252.242-7000	POSTAWARD CONFERENCE (DEC 1991)
111.	FAR 52.243-4	CHANGES (AUG 1987)

112. DFARS 252.243-7001

PRICING OF CONTRACT MODIFICATIONS (DEC 1991)

113. FAR 52.244-1

SUBCONTRACTS (FIXED-PRICE CONTRACTS) (FEB 1995)
(APPLICABLE OVER \$500,000)

- 114. FAR 52.245-1 PROPERTY RECORDS (APR 1984)
(APPLICABLE IF GOVERNMENT-FURNISHED PROPERTY
(GFP) IS INVOLVED AND THE GOVERNMENT WILL
MAINTAIN OFFICIAL PROPERTY RECORDS-IF THERE IS
ANY GFP SECTION 00800 WILL CONTAIN A LIST OF THE
GFP)
- 115. FAR 52.245-2 GOVERNMENT PROPERTY (FIXED-PRICE CONTRACTS (DEC
1989)
(APPLICABLE IF GOVERNMENT-FURNISHED PROPERTY IS
INVOLVED WORTH OVER \$100,000-SEE SECTION 00800)
- 116. FAR 52.245-4 GOVERNMENT-FURNISHED PROPERTY (SHORT FORM) (APR
1984)
(APPLICABLE IF GOVERNMENT-FURNISHED PROPERTY IS
INVOLVED WORTH \$100,000 OR LESS - SEE SECTION
00800)
- 117. DFARS 252.245-7001 REPORTS OF GOVERNMENT PROPERTY (MAY 1994)
(APPLICABLE IF FAR 52.245-2 IS APPLICABLE)
- 118. FAR 52.246-21 WARRANTY OF CONSTRUCTION (MAR 1994)
(NOT APPLICABLE TO CONTRACTS SOLELY FOR
DREDGING, EXCAVATION, GRUBBING OR CLEARING;
EFARS 46.710)
- 119. DFARS 252.247-7024 NOTIFICATION OF TRANSPORTATION OF SUPPLIES BY
SEA (NOV 1995)
(APPLICABLE IF THE ANSWER TO SECTION 00600,
DFARS 52.247-7002, IS NEGATIVE)
- 120. FAR 52.248-3 VALUE ENGINEERING--CONSTRUCTION (MAR 1989)
(APPLICABLE OVER \$100,000)
- 121. FAR 52.249-1 TERMINATION FOR CONVENIENCE OF THE GOVERNMENT
(FIXED-PRICE) (SHORT FORM) (APR 1984)
(APPLICABLE \$100,000 OR LESS)
- 122. FAR 52.249-2 I TERMINATION FOR CONVENIENCE OF THE GOVERNMENT
(FIXED-PRICE) (SEP 1996)--ALTERNATE I (SEP 1996)
(APPLICABLE OVER \$100,000)
- 123. FAR 52.249-10 DEFAULT (FIXED-PRICE CONSTRUCTION) (APR 1984)
- 124. DFARS 252.249-7001 NOTIFICATION OF SUBSTANTIAL IMPACT ON EMPLOYMENT
(DEC 1991)
(APPLICABLE IF CONTRACT IS OVER \$5 MILLION WITH
SUBCONTRACTS OVER \$500,000)
- 125. FAR 52.253-1 COMPUTER-GENERATED FORMS (JAN 1991)

THE FOLLOWING CONTRACT CLAUSES ARE INCLUDED IN FULL TEXT

- 126. FAR 52.219-9 SMALL, SMALL DISADVANTAGED AND WOMEN-OWNED SMALL BUSINESS SUBCONTRACTING PLAN (AUG 1996)
(APPLICABLE IF NEGOTIATED - SEE BLOCK 2, SF 1442 - AND OVER \$1 MILLION; REQUIRED FROM LARGE BUSINESSES ONLY) (SEE ATTACHMENT SECTION)
- 127. FAR 52.219-9 I SMALL, SMALL DISADVANTAGED AND WOMEN-OWNED SMALL BUSINESS SUBCONTRACTING PLAN (AUG 1996)--
ALTERNATE I (OCT 1995)
(APPLICABLE IF SEALED BIDDING - SEE BLOCK 2, SF1442 - OVER \$1 MILLION; REQUIRED FROM LARGE BUSINESSES ONLY) (SEE ATTACHMENT SECTION)
- 128. FAR 52.223-7 NOTICE OF RADIOACTIVE MATERIALS (NOV 1991)
(APPLICABLE IF RADIOACTIVE MATERIALS ARE INVOLVED)
- 129. FAR 52.225-5 BUY AMERICAN ACT--CONSTRUCTION MATERIALS (MAY 1997)
(APPLICABLE IF FAR 52.225-15, DFARS 252.225-7007, OR DFARS 252.225-7036 ARE NOT APPLICABLE - SEE BELOW)
- 130. FAR 52.225-15 BUY AMERICAN ACT--CONSTRUCTION MATERIALS UNDER TRADE AGREEMENTS ACT AND NORTH AMERICAN FREE TRADE AGREEMENT (MAY 1997)
(APPLICABLE IF CONTRACT AMOUNT IS \$7,311,000 OR OVER EXCEPT WHEN SMALL OR SMALL, DISADVANTAGED BUSINESS PREFERENCE PROGRAM APPLIES TO THIS ACQUISITION)
- 131. FAR 52.225-15 I BUY AMERICAN ACT--CONSTRUCTION MATERIALS UNDER TRADE AGREEMENTS ACT AND NORTH AMERICAN FREE TRADE AGREEMENT (MAY 1997)--ALTERNATE I (MAY 1997)
(APPLICABLE IF CONTRACT AMOUNT IS FROM \$6,500,000 TO \$7,311,000 EXCEPT WHEN SMALL OR SMALL, DISADVANTAGED BUSINESS PREFERENCE PROGRAM APPLIES TO THIS ACQUISITION)
- 132. DFARS 252.225-7031 SECONDARY ARAB BOYCOTT OF ISRAEL (JUN 1992)
- 133. SAACONS 52.0236-4820 ORDER OF PRECEDENCE (JAN 1993)
- 134. FAR 52.243-7 NOTIFICATION OF CHANGES (APR 1984)
- 135. DFARS 252.247-7023 TRANSPORTATION OF SUPPLIES BY SEA (NOV 1995)
- 136. FAR 52.252-4 ALTERATIONS IN CONTRACT (APR 1984)
- 137. FAR 52.252-6 AUTHORIZED DEVIATIONS IN CLAUSES (APR 1984)
- 138. DFARS 252.223-7004 DRUG-FREE WORK FORCE (SEP 1988)
- 139. EFARS 52.249-5000 BASIS FOR SETTLEMENT OF PROPOSALS (DEC 1995)

CONTRACT CLAUSES IN FULL TEXT

126. FAR 52.219-9

SMALL, SMALL DISADVANTAGED AND WOMEN-OWNED SMALL
BUSINESS SUBCONTRACTING PLAN (AUG 1996)
(APPLICABLE IF NEGOTIATED - SEE BLOCK 2, SF 1442
- AND OVER \$1 MILLION; REQUIRED FROM LARGE
BUSINESSES ONLY; SEE ATTACHMENTS SECTION)

(a) This clause does not apply to small business concerns.

(b) "Commercial product," as used in this clause, means a product in regular production that is sold in substantial quantities to the general public and/or industry at established catalog or market prices. It also means a product which, in the opinion of the Contracting Officer, differs only insignificantly from the Contractor's commercial product.

"Subcontract," as used in this clause, means any agreement (other than one involving an employer-employee relationship) entered into by a Federal Government prime Contractor or subcontractor calling for supplies or services required for performance of the contract or subcontract.

(c) The offeror, upon request by the Contracting Officer, shall submit and negotiate a subcontracting plan, where applicable, which separately addresses subcontracting with small business concerns, with small disadvantaged business concerns and with women-owned small business concerns. If the offeror is submitting an individual contract plan, the plan must separately address subcontracting with small business concerns, small disadvantaged business concerns, and women-owned small business concerns with a separate part for the basic contract and separate parts for each option (if any). The plan shall be included in and made a part of the resultant contract. The subcontracting plan shall be negotiated within the time specified by the Contracting Officer. Failure to submit and negotiate the subcontracting plan shall make the offeror ineligible for award of a contract.

(d) The offeror's subcontracting plan shall include the following:

(1) Goals, expressed in terms of percentages of total planned subcontracting dollars, for the use of small business concerns, small disadvantaged business concerns and women-owned small business concerns as subcontractors. The offeror shall include all subcontracts that contribute to contract performance, and may include a proportionate share of products and services that are normally allocated as indirect costs.

(2) A statement of--

(i) Total dollars planned to be subcontracted;

(ii) Total dollars planned to be subcontracted to small business concerns; and

(iii) Total dollars planned to be subcontracted to small disadvantaged business concerns; and

(iv) Total dollars planned to be subcontracted to women-owned small business concerns.

(3) A description of the principal types of supplies and services to be subcontracted, and an identification of the types planned for subcontracting to (i) small business concerns, (ii) small disadvantaged business concerns and (iii) women-owned small business concerns.

(4) A description of the method used to develop the subcontracting goals in paragraph (d)(1) of this clause.

(5) A description of the method used to identify potential sources for solicitation purposes (e.g., existing company source lists, the Procurement Automated Source System (PASS) of the Small Business Administration, the National Minority Purchasing Council Vendor Information Service, the Research and Information Division of the Minority Business Development Agency in the Department of Commerce, or small, small disadvantaged and women-owned small business concerns trade associations). A firm may rely on the information contained in PASS as an accurate representation of a concern's size and ownership characteristics for purposes of maintaining a small business source list. A firm may rely on PASS as its small business source list. Use of the PASS as its source list does not relieve a firm of its responsibilities (i.e.,

outreach, assistance, counseling, publicizing subcontracting opportunities) in this clause.

(6) A statement as to whether or not the offeror included indirect costs in establishing subcontracting goals, and a description of the method used to determine the proportionate share of indirect costs to be incurred with (i) small business concerns, (ii) small disadvantaged business concerns, and (iii) women-owned small business concerns.

(7) The name of the individual employed by the offeror who will administer the offeror's subcontracting program, and a description of the duties of the individual.

(8) A description of the efforts the offeror will make to assure that small, small disadvantaged and women-owned small business concerns have an equitable opportunity to compete for subcontracts.

(9) Assurances that the offeror will include the clause in this contract entitled "Utilization of Small, Small Disadvantaged and Women-Owned Small Business Concerns" in all subcontracts that offer further subcontracting opportunities, and that the offeror will require all subcontractors (except small business concerns) who receive subcontracts in excess of \$500,000 (\$1,000,000 for construction of any public facility) to adopt a plan similar to the plan agreed to by the offeror.

(10) Assurances that the offeror will (i) cooperate in any studies or surveys as may be required, (ii) submit periodic reports in order to allow the Government to determine the extent of compliance by the offeror with the subcontracting plan, (iii) submit Standard Form (SF) 294, Subcontracting Report for Individual Contracts, and/or SF 295, Summary Subcontract Report, in accordance with the instructions on the forms, and (iv) ensure that its subcontractors agree to submit Standard Forms 294 and 295.

(11) A recitation of the types of records the offeror will maintain to demonstrate procedures that have been adopted to comply with the requirements and goals in the plan, including establishing source lists; and a description of its efforts to locate small, small disadvantaged and women-owned small business concerns and award subcontracts to them. The records shall include at least the following (on a plant-wide or company-wide basis, unless otherwise indicated):

(i) Source lists (e.g., PASS), guides, and other data that identify small, small disadvantaged and women-owned small business concerns.

(ii) Organizations contacted in an attempt to locate sources that are small, small disadvantaged or women-owned small business concerns.

(iii) Records on each subcontract solicitation resulting in an award of more than \$100,000, indicating (A) whether small business concerns were solicited and if not, why not, (B) whether small disadvantaged business concerns were solicited and if not, why not, (C) whether women-owned small business concerns were solicited and if not, why not, and (D) if applicable, the reason award was not made to a small business concern.

(iv) Records of any outreach efforts to contact (A) trade associations, (B) business development organizations, and (C) conferences and trade fairs to locate small, small disadvantaged and women-owned small business sources.

(v) Records of internal guidance and encouragement provided to buyers through (A) workshops, seminars, training, etc., and (B) monitoring performance to evaluate compliance with the programs's requirements.

(vi) On a contract-by-contract basis, records to support award data submitted by the offeror to the Government, including the name, address, and business size of each subcontractor. Contractors having company or division-wide annual plans need not comply with this requirement.

(e) In order to effectively implement this plan to the extent consistent with efficient contract performance, the Contractor shall perform the following functions:

(1) Assist small, small disadvantaged and women-owned small business concerns by arranging solicitations, time for the preparation of bids, quantities, specifications, and delivery schedules so as to facilitate the participation by such concerns. Where the contractor's lists of potential small, small disadvantaged and women-owned small business subcontractors are

excessively long, reasonable effort shall be made to give all such small business concerns an opportunity to compete over a period of time.

(2) Provide adequate and timely consideration of the potentialities of small, small disadvantaged and women-owned small business concerns in all "make-or-buy" decisions.

(3) Counsel and discuss subcontracting opportunities with representatives of small, small disadvantaged and women-owned small business firms.

(4) Provide notice to subcontractors concerning penalties and remedies for misrepresentations of business status as small, small disadvantaged or women-owned small business for the purpose of obtaining a subcontract that is to be included as part or all of a goal contained in the Contractor's subcontracting plan.

(f) A master subcontracting plan on a plant or division-wide basis which contains all the elements required by (d) of this clause, except goals, may be incorporated by reference as a part of the subcontracting plan required of the offeror by this clause; provided, (1) the master plan has been approved, (2) the offeror ensures that the plan is updated as necessary and provides copies of the approved master plan, including evidence of its approval, to the Contracting Officer, and (3) goals and any deviations from the master plan deemed necessary by the Contracting Officer to satisfy the requirements of this contract are set forth in the individual subcontracting plan.

(g)(1) If a commercial product is offered, the subcontracting plan required by this clause may relate to the offeror's production generally, for both commercial and noncommercial products, rather than solely to the Government contract. In these cases, the offeror shall, with the concurrence of the Contracting Officer, submit one company-wide or division-wide annual plan.

(2) The annual plan shall be reviewed for approval by the agency awarding the offeror its first prime contract requiring a subcontracting plan during the fiscal year, or by an agency satisfactory to the Contracting Officer.

(3) The approved plan shall remain in effect during the offeror's fiscal year for all of the offeror's commercial products.

(h) Prior compliance of the offeror with other such subcontracting plans under previous contracts will be considered by the Contracting Officer in determining the responsibility of the offeror for award of the contract.

(i) The failure of the Contractor or subcontractor to comply in good faith with (1) the clause of this contract entitled "Utilization of Small, Small Disadvantaged and Women-Owned Small Business Concerns," or (2) an approved plan required by this clause, shall be a material breach of the contract.

127. FAR 52.219-9 I

SMALL, SMALL DISADVANTAGED AND WOMEN-OWNED SMALL BUSINESS SUBCONTRACTING PLAN (AUG 1996)--ALTERNATE I (OCT 1995)
(APPLICABLE IF SEALED BIDDING - SEE BLOCK 2, SF 1442 - AND OVER \$1 MILLION; REQUIRED FROM LARGE BUSINESSES ONLY; SEE ATTACHMENTS SECTION)

(a) This clause does not apply to small business concerns.

(b) "Commercial product," as used in this clause, means a product in regular production that is sold in substantial quantities to the general public and/or industry at established catalog or market prices. It also means a product which, in the opinion of the Contracting Officer, differs only insignificantly from the Contractor's commercial product.

"Subcontract," as used in this clause, means any agreement (other than one involving an employer-employee relationship) entered into by a Federal Government prime Contractor or subcontractor calling for supplies or services required for performance of the contract or subcontract.

(c) The apparent low bidder, upon request by the Contracting Officer, shall submit a subcontracting plan, where applicable, which separately addresses subcontracting with small business concerns, with small disadvantaged business concerns and with women-owned small business concerns. If the bidder is submitting an individual contract plan, the plan must

separately address subcontracting with small business concerns, small disadvantaged business concerns, and women-owned small business concerns with a separate part for the basic contract and separate parts for each option (if any). The plan shall be included in and made a part of the resultant contract. The subcontracting plan shall be submitted within the time specified by the Contracting Officer. Failure to submit the subcontracting plan shall make the bidder ineligible for the award of a contract.

(d) The offeror's subcontracting plan shall include the following:

(1) Goals, expressed in terms of percentages of total planned subcontracting dollars, for the use of small business concerns, small disadvantaged business concerns and women-owned small business concerns as subcontractors. The offeror shall include all subcontracts that contribute to contract performance, and may include a proportionate share of products and services that are normally allocated as indirect costs.

(2) A statement of--

(i) Total dollars planned to be subcontracted;

(ii) Total dollars planned to be subcontracted to small business concerns; and

(iii) Total dollars planned to be subcontracted to small disadvantaged business concerns; and

(iv) Total dollars planned to be subcontracted to women-owned small business concerns.

(3) A description of the principal types of supplies and services to be subcontracted, and an identification of the types planned for subcontracting to (i) small business concerns, (ii) small disadvantaged business concerns and (iii) women-owned small business concerns.

(4) A description of the method used to develop the subcontracting goals in paragraph (d)(1) of this clause.

(5) A description of the method used to identify potential sources for solicitation purposes (e.g., existing company source lists, the Procurement Automated Source System (PASS) of the Small Business Administration, the National Minority Purchasing Council Vendor Information Service, the Research and Information Division of the Minority Business Development Agency in the Department of Commerce, or small, small disadvantaged and women-owned small business concerns trade associations). A firm may rely on the information contained in PASS as an accurate representation of a concern's size and ownership characteristics for purposes of maintaining a small business source list. A firm may rely on PASS as its small business source list. Use of the PASS as its source list does not relieve a firm of its responsibilities (i.e., outreach, assistance, counseling, publicizing subcontracting opportunities) in this clause.

(6) A statement as to whether or not the offeror included indirect costs in establishing subcontracting goals, and a description of the method used to determine the proportionate share of indirect costs to be incurred with (i) small business concerns, (ii) small disadvantaged business concerns, and (iii) women-owned small business concerns.

(7) The name of the individual employed by the offeror who will administer the offeror's subcontracting program, and a description of the duties of the individual.

(8) A description of the efforts the offeror will make to assure that small, small disadvantaged and women-owned small business concerns have an equitable opportunity to compete for subcontracts.

(9) Assurances that the offeror will include the clause in this contract entitled "Utilization of Small, Small Disadvantaged and Women-Owned Small Business Concerns" in all subcontracts that offer further subcontracting opportunities, and that the offeror will require all subcontractors (except small business concerns) who receive subcontracts in excess of \$500,000 (\$1,000,000 for construction of any public facility) to adopt a plan similar to the plan agreed to by the offeror.

(10) Assurances that the offeror will (i) cooperate in any studies or surveys as may be required, (ii) submit periodic reports in order to allow the Government to determine the extent of compliance by the offeror with the subcontracting plan, (iii) submit Standard Form (SF) 294, Subcontracting

Report for Individual Contracts, and/or SF 295, Summary Subcontract Report, in accordance with the instructions on the forms, and (iv) ensure that its subcontractors agree to submit Standard Forms 294 and 295.

(11) A recitation of the types of records the offeror will maintain to demonstrate procedures that have been adopted to comply with the requirements and goals in the plan, including establishing source lists; and a description of its efforts to locate small, small disadvantaged and women-owned small business concerns and award subcontracts to them. The records shall include at least the following (on a plant-wide or company-wide basis, unless otherwise indicated):

(i) Source lists (e.g., PASS), guides, and other data that identify small, small disadvantaged and women-owned small business concerns.

(ii) Organizations contacted in an attempt to locate sources that are small, small disadvantaged or women-owned small business concerns.

(iii) Records on each subcontract solicitation resulting in an award of more than \$100,000, indicating (A) whether small business concerns were solicited and if not, why not, (B) whether small disadvantaged business concerns were solicited and if not, why not, (C) whether women-owned small business concerns were solicited and if not, why not, and (D) if applicable, the reason award was not made to a small business concern.

(iv) Records of any outreach efforts to contact (A) trade associations, (B) business development organizations, and (C) conferences and trade fairs to locate small, small disadvantaged and women-owned small business sources.

(v) Records of internal guidance and encouragement provided to buyers through (A) workshops, seminars, training, etc., and (B) monitoring performance to evaluate compliance with the programs's requirements.

(vi) On a contract-by-contract basis, records to support award data submitted by the offeror to the Government, including the name, address, and business size of each subcontractor. Contractors having company or division-wide annual plans need not comply with this requirement.

(e) In order to effectively implement this plan to the extent consistent with efficient contract performance, the Contractor shall perform the following functions:

(1) Assist small, small disadvantaged and women-owned small business concerns by arranging solicitations, time for the preparation of bids, quantities, specifications, and delivery schedules so as to facilitate the participation by such concerns. Where the contractor's lists of potential small, small disadvantaged and women-owned small business subcontractors are excessively long, reasonable effort shall be made to give all such small business concerns an opportunity to compete over a period of time.

(2) Provide adequate and timely consideration of the potentialities of small, small disadvantaged and women-owned small business concerns in all "make-or-buy" decisions.

(3) Counsel and discuss subcontracting opportunities with representatives of small, small disadvantaged and women-owned small business firms.

(4) Provide notice to subcontractors concerning penalties and remedies for misrepresentations of business status as small, small disadvantaged or women-owned small business for the purpose of obtaining a subcontract that is to be included as part or all of a goal contained in the Contractor's subcontracting plan.

(f) A master subcontracting plan on a plant or division-wide basis which contains all the elements required by (d) of this clause, except goals, may be incorporated by reference as a part of the subcontracting plan required of the offeror by this clause; provided, (1) the master plan has been approved, (2) the offeror ensures that the plan is updated as necessary and provides copies of the approved master plan, including evidence of its approval, to the Contracting Officer, and (3) goals and any deviations from the master plan deemed necessary by the Contracting Officer to satisfy the requirements of this contract are set forth in the individual subcontracting plan.

(g)(1) If a commercial product is offered, the subcontracting plan required by this clause may relate to the offeror's production generally, for both commercial and noncommercial products, rather than solely to the Government contract. In these cases, the offeror shall, with the concurrence

of the Contracting Officer, submit one company-wide or division-wide annual plan.

(2) The annual plan shall be reviewed for approval by the agency awarding the offeror its first prime contract requiring a subcontracting plan during the fiscal year, or by an agency satisfactory to the Contracting Officer.

(3) The approved plan shall remain in effect during the offeror's fiscal year for all of the offeror's commercial products.

(h) Prior compliance of the offeror with other such subcontracting plans under previous contracts will be considered by the Contracting Officer in determining the responsibility of the offeror for award of the contract.

(i) The failure of the Contractor or subcontractor to comply in good faith with (1) the clause of this contract entitled "Utilization of Small, Small Disadvantaged and Women-Owned Small Business Concerns," or (2) an approved plan required by this clause, shall be a material breach of the contract.

128. FAR 52.223-7

NOTICE OF RADIOACTIVE MATERIALS (NOV 1991)
(APPLICABLE IF RADIOACTIVE MATERIALS ARE
INVOLVED - SEE SPECIFICATIONS)

(a) The Contractor shall notify the Contracting Officer or designee, in writing, 14 days prior to the delivery of, or prior to completion of any servicing required by this contract of, items containing either (1) radioactive material requiring specific licensing under the regulations issued pursuant to the Atomic Energy Act of 1954, as amended, as set forth in Title 10 of the Code of Federal Regulations, in effect on the date of this contract, or (2) other radioactive material not requiring specific licensing in which the specific activity is greater than 0.002 microcuries per gram or the activity per item equals or exceeds 0.01 microcuries. Such notice shall specify the part or parts of the items which contain radioactive materials, a description of the materials, the name and activity of the isotope, the manufacturer of the materials, and any other information known to the Contractor which will put users of the items on notice as to the hazards involved (OMB No. 9000-0107).

(b) If there has been no change affecting the quantity of activity, or the characteristics and composition of the radioactive material from deliveries under this contract or prior contracts, the Contractor may request that the Contracting Officer or designee waive the notice requirement in paragraph (a) of this clause. Any such request shall--

(1) Be submitted in writing;

(2) Contain a certification that the quantity of activity, characteristics, and composition of the radioactive material have not changed; and

(3) Cite the contract number on which the prior notification was submitted and the contracting office to which it was submitted.

(c) All items, parts, or subassemblies which contain radioactive materials in which the specific activity is greater than 0.002 microcuries per gram or activity per item equals or exceeds 0.01 microcuries, and all containers in which such items, parts or subassemblies are delivered to the Government shall be clearly marked and labeled as required by the latest revision of MIL-STD 129 in effect on the date of the contract.

(d) This clause, including this paragraph (d), shall be inserted in all subcontracts for radioactive materials meeting the criteria in paragraph (a) of this clause.

129. FAR 52.225-5

BUY AMERICAN ACT -- CONSTRUCTION MATERIALS (MAY 1997)

(a) Definitions. As used in this clause --

"Components" means those articles, materials, and supplies incorporated directly into construction materials.

"Construction material" means an article, material, or supply brought to the construction site for incorporation into the building or work.

Construction material also includes an item brought to the site pre-assembled from articles, materials or supplies. However, emergency life safety systems, such as emergency lighting, fire alarm, and audio evacuation systems, which are discrete systems incorporated into a public building or work and which are produced as a complete system, shall be evaluated as a single and distinct construction material regardless of when or how the individual parts or components of such systems are delivered to the construction site.

"Domestic construction material" means (1) an unmanufactured construction material mined or produced in the United States, or (2) a construction material manufactured in the United States, if the cost of its components mined, produced, or manufactured in the United States exceeds 50 percent of the cost of all its components. Components of foreign origin of the same class or kind as the construction materials determined to be unavailable pursuant to subparagraph 25.202(a)(2) of the Federal Acquisition Regulation (FAR) shall be treated as domestic.

(b)(1) The Buy American Act (41 U.S.C. 10a-10d) requires that only domestic construction material be used in performing this contract, except as provided in paragraphs (b)(2) and (b)(3) of this clause.

(2) This requirement does not apply to the excepted construction materials or components listed by the Government as follows:

(List applicable accepted materials or indicate "none")

(3) Other foreign construction material may be added to the list in paragraph (b)(2) of this clause if the Government determines that --

(i) The cost would be unreasonable (the cost of a particular domestic construction material shall be determined to be unreasonable when the cost of such material exceeds the cost of foreign material by more than 6 percent, unless the agency head determines a higher percentage to be appropriate);

(ii) The application of the restriction of the Buy American Act to a particular construction material would be impracticable or inconsistent with the public interest; or

(iii) The construction material is not mined, produced, or manufactured in the United States in sufficient and reasonably available commercial quantities of a satisfactory quality.

(4) The Contractor agrees that only domestic construction material will be used by the Contractor, subcontractors, material men, and suppliers in the performance of this contract, except for foreign construction materials, if any listed in paragraph (b)(2) of this clause.

(c) Request for determination. (1) Contractors requesting to use foreign construction material under paragraph (b)(3) of this clause shall provide adequate information for Government evaluation of the request for a determination regarding the inapplicability of the Buy American Act. Each submission shall include a description of the foreign and domestic construction materials, including unit of measure, quantity, price, time of delivery or availability, location of the construction project, name and address of the proposed contractor, and a detailed justification of the reason for use of foreign materials cited in accordance with paragraph (b)(3) of this clause. A submission based on unreasonable cost shall include a reasonable survey of the marked and a completed price comparison table in the format in paragraph (d) of this clause. The price of construction material shall include all delivery costs to the construction site and any applicable duty (whether or not a duty-free certificate may be issued).

(2) If the Government determines after contract award that an exception to the Buy American Act applies, the contract shall be modified to allow use of the foreign construction material, and adequate consideration shall be negotiated. However, when the basis for the exception is the unreasonable price of a domestic construction material, adequate consideration shall not be less than the differential established in paragraph (b)(3)(i) of this clause.

(3) If the Government does not determine that an exception to the Buy American Act applies, the use of that particular foreign construction material will be a failure to comply with the Act.

(d) For evaluation of requests under paragraph (c) of this clause based on unreasonable cost, the following information and any applicable supporting data based on the survey of suppliers shall be included in the request:

FOREIGN AND DOMESTIC CONSTRUCTION
MATERIALS PRICE COMPARISON

CONSTRUCTION MATERIAL DESCRIPTION	UNIT OF MEASURE	QUANTITY	PRICE (DOLLARS) *
Item 1:			
Foreign construction material	_____	_____	_____
Domestic construction material	_____	_____	_____
Item 2:			
Foreign construction material	_____	_____	_____
Domestic construction material	_____	_____	_____

List name, address telephone number, and contact for suppliers surveyed.
Attach copy of response; if oral, attach summary.
Include other applicable supporting information.

*Include all delivery costs to the construction site and any applicable duty
(whether or not a duty-free entry certificate is issued).

130. FAR 52.225-15 BUY AMERICAN ACT -- CONSTRUCTION MATERIALS UNDER
TRADE AGREEMENTS ACT AND NORTH AMERICAN FREE
TRADE AGREEMENT (MAY 1997)

(a) Definitions. As used in this clause--

"Components" means those articles, materials, and supplies incorporated
directly into construction materials.

"Construction material" means an article, material, or supply brought to
the construction site for incorporation into the building or work.
Construction material also includes an item brought to the site pre-assembled
from articles, materials, or supplies. However, emergency life safety
systems, such as emergency lighting, fire alarm, and audio evacuation
systems, which are discrete systems incorporated into a public building or
work and which are produced as a complete system, shall be evaluated as a
single and distinct construction material regardless of when or how the
individual parts or components of such systems are delivered to the
construction site.

"Designated country construction material" means a construction material
that-- (1) Is wholly the growth, product, or manufacture of a designated
country (as defined at FAR 25.401); or (2) In the case of a construction
material which consists in whole or in part of materials from another country
or instrumentality, has been substantially transformed in a designated country
into a new and different construction material distinct from the materials
from which it was transformed.

"Domestic construction material" means (1) an unmanufactured construction
material mined or produced in the United States, or (2) a construction
material manufactured in the United States, if the cost of its components
mined, produced, or manufactured in the United States exceeds 50 percent of
the cost of all its components. Components of foreign origin of the same
class or kind as the construction materials determined to be unavailable

pursuant to subparagraph 25.202(a)(2) of the Federal Acquisition Regulation (FAR) shall be treated as domestic.

"North American Free Trade Agreement (NAFTA) country" means Canada or Mexico.

"NAFTA country construction material" means a construction material that-- (1) Is wholly the growth, product, or manufacture of a NAFTA country; or (2) In the case of a construction material which consists in whole or in part of materials from another country or instrumentality, has been substantially transformed in a NAFTA country into a new and different construction material distinct from the materials from which it was transformed.

(b)(1) The Buy American Act (41 U.S.C. 10a - 10d) requires that only domestic construction material be used in performing this contract, except as provided in paragraphs (b)(2), (b)(3), and (b)(4) of this clause.

(2) The Trade Agreements Act and the North American Free Trade Agreement (NAFTA) provide that designated country and NAFTA country construction materials are exempted from application of the Buy American Act.

(3) The requirement in paragraph (b)(1) of this clause does not apply to the excepted construction material or components listed by the Government as follows:

List applicable excepted materials or indicate "None"

(4) Other foreign construction material may be added to the list in paragraph (b)(3) of this clause if the Government determines that--

(i) The cost would be unreasonable (the cost of a particular domestic construction material shall be determined to be unreasonable when the cost of such material exceeds the cost of foreign material by more than 6 percent, unless the agency head determines a higher percentage to be appropriate);

(ii) The application of the restriction of the Buy American Act to a particular construction material would be impracticable or inconsistent with the public interest; or

(iii) The construction material is not mined, produced, or manufactured in the United States in sufficient and reasonably available commercial quantities of a satisfactory quality.

(5) The Contractor agrees that only domestic construction materials, NAFTA country construction materials, or designated country construction materials will be used by the Contractor, subcontractors, material men, and suppliers in the performance of this contract, except for foreign construction materials, if any, listed in paragraph (b)(3) of this clause.

(c) Request for determination. (1) Contractors requesting to use foreign construction material under paragraph (b)(4) of this clause shall provide adequate information for Government evaluation of the request for a determination regarding the inapplicability of the Buy American Act. Each submission shall include a description of the foreign and domestic construction materials, including unit of measure, quantity, price, time of delivery or availability, location of the construction project, name and address of the proposed contractor, and a detailed justification of the reason for use of foreign materials cited in accordance with paragraph (b)(4) of this clause. A submission based on unreasonable cost shall include a reasonable survey of the market and a completed price comparison table in the format in paragraph (d) of this clause. The price of construction material shall include all delivery costs to the construction site and any applicable duty (whether or not a duty-free certificate may be issued).

(2) If the Government determines after contract award that an exception to the Buy American Act applies, the contract shall be modified to allow use of the foreign construction material, and adequate consideration shall be negotiated. However, when the basis for the exception is the unreasonable

price of a domestic construction material, adequate consideration shall not be less than the differential established in paragraph (b)(4)(i) of this clause.

(3) If the Government does not determine that an exception to the Buy American Act applies, the use of that particular foreign construction material will be a failure to comply with the Act.

(d) For evaluation of requests under paragraph (c) of this clause based on unreasonable cost, the following information and any applicable supporting data based on the survey of suppliers shall be included in the request:

FOREIGN AND DOMESTIC CONSTRUCTION
MATERIALS PRICE COMPARISON

CONSTRUCTION MATERIAL DESCRIPTION	UNIT OF MEASURE	QUANTITY	PRICE (DOLLARS) *
Item 1:			
Foreign construction material	_____	_____	_____
Domestic construction material	_____	_____	_____
Item 2:			
Foreign construction material	_____	_____	_____
Domestic construction material	_____	_____	_____

List name, address telephone number, and contact for suppliers surveyed.
Attach copy of response; if oral, attach summary.

Include other applicable supporting information.

*Include all delivery costs to the construction site and any applicable duty (whether or not a duty-free entry certificate is issued).

131. FAR 52.225-15 I BUY AMERICAN ACT -- CONSTRUCTION MATERIALS UNDER
TRADE AGREEMENTS ACT AND NORTH AMERICAN FREE
TRADE AGREEMENT (MAY 1997)-- ALTERNATE I (MAY
1997)

(a) Definitions. As used in this clause--

"Components" means those articles, materials, and supplies incorporated directly into construction materials.

"Construction material" means an article, material, or supply brought to the construction site for incorporation into the building or work. Construction material also includes an item brought to the site pre-assembled from articles, materials, or supplies. However, emergency life safety systems, such as emergency lighting, fire alarm, and audio evacuation systems, which are discrete systems incorporated into a public building or work and which are produced as a complete system, shall be evaluated as a single and distinct construction material regardless of when or how the individual parts or components of such systems are delivered to the construction site.

"Designated country construction material" means a construction material that-- (1) Is wholly the growth, product, or manufacture of a designated country (as defined at FAR 25.401); or (2) In the case of a construction

material which consists in whole or in part of materials from another country or instrumentality, has been substantially transformed in a designated country into a new and different construction material distinct from the materials from which it was transformed.

"Domestic construction material" means (1) an unmanufactured construction material mined or produced in the United States, or (2) a construction material manufactured in the United States, if the cost of its components mined, produced, or manufactured in the United States exceeds 50 percent of the cost of all its components. Components of foreign origin of the same class or kind as the construction materials determined to be unavailable pursuant to subparagraph 25.202(a)(2) of the Federal Acquisition Regulation (FAR) shall be treated as domestic.

"North American Free Trade Agreement (NAFTA) country" means Canada or Mexico.

"NAFTA country construction material" means a construction material that-- (1) Is wholly the growth, product, or manufacture of a NAFTA country; or (2) In the case of a construction material which consists in whole or in part of materials from another country or instrumentality, has been substantially transformed in a NAFTA country into a new and different construction material distinct from the materials from which it was transformed.

(b)(1) The Buy American Act (41 U.S.C. 10a - 10d) requires that only domestic construction material be used in performing this contract, except as provided in paragraphs (b)(2), (b)(3), and (b)(4) of this clause.

(2) The North American Free Trade Agreement (NAFTA) provides that NAFTA construction materials are exempted from application of the Buy American Act.

(3) The requirement in paragraph (b)(1) of this clause does not apply to the excepted construction material or components listed by the Government as follows:

List applicable excepted materials or indicate "None"

(4) Other foreign construction material may be added to the list in paragraph (b)(3) of this clause if the Government determines that--

(i) The cost would be unreasonable (the cost of a particular domestic construction material shall be determined to be unreasonable when the cost of such material exceeds the cost of foreign material by more than 6 percent, unless the agency head determines a higher percentage to be appropriate);

(ii) The application of the restriction of the Buy American Act to a particular construction material would be impracticable or inconsistent with the public interest; or

(iii) The construction material is not mined, produced, or manufactured in the United States in sufficient and reasonably available commercial quantities of a satisfactory quality.

(5) The Contractor agrees that only domestic construction materials, or NAFTA country construction materials will be used by the Contractor, subcontractors, material men, and suppliers in the performance of this contract, except for foreign construction materials, if any, listed in paragraph (b)(3) of this clause.

(c) Request for determination. (1) Contractors requesting to use foreign construction material under paragraph (b)(4) of this clause shall provide adequate information for Government evaluation of the request for a determination regarding the inapplicability of the Buy American Act. Each submission shall include a description of the foreign and domestic construction materials, including unit of measure, quantity, price, time of delivery or availability, location of the construction project, name and address of the proposed contractor, and a detailed justification of the reason for use of foreign materials cited in accordance with paragraph (b)(4) of this clause. A submission based on unreasonable cost shall include a reasonable

survey of the market and a completed price comparison table in the format in paragraph (d) of this clause. The price of construction material shall include all delivery costs to the construction site and any applicable duty (whether or not a duty-free certificate may be issued).

(2) If the Government determines after contract award that an exception to the Buy American Act applies, the contract shall be modified to allow use of the foreign construction material, and adequate consideration shall be negotiated. However, when the basis for the exception is the unreasonable price of a domestic construction material, adequate consideration shall not be less than the differential established in paragraph (b)(4)(i) of this clause.

(3) If the Government does not determine that an exception to the Buy American Act applies, the use of that particular foreign construction material will be a failure to comply with the Act.

(d) For evaluation of requests under paragraph (c) of this clause based on unreasonable cost, the following information and any applicable supporting data based on the survey of suppliers shall be included in the request:

FOREIGN AND DOMESTIC CONSTRUCTION
MATERIALS PRICE COMPARISON

CONSTRUCTION MATERIAL DESCRIPTION	UNIT OF MEASURE	QUANTITY	PRICE (DOLLARS) *
Item 1:			
Foreign			
construction			
material	_____	_____	_____
Domestic			
construction			
material	_____	_____	_____
Item 2:			
Foreign			
construction			
material	_____	_____	_____
Domestic			
construction			
material	_____	_____	_____

List name, address telephone number, and contact for suppliers surveyed.
Attach copy of response; if oral, attach summary.

Include other applicable supporting information.

*Include all delivery costs to the construction site and any applicable duty (whether or not a duty-free entry certificate is issued).

132. DFARS 252.225-7031 SECONDARY ARAB BOYCOTT OF ISRAEL (JUN 1992)

(A) Definitions.

As used in this clause--

"Foreign Person" means any person other than a United States person as defined in Section 16(2) of the Export Administration Act of 1979 (50 U.S.C. APP. SEC 2415).

"United States Person" is defined in Section 16(2) of the Export Administration Act of 1979 and means any United States resident or national (other than an individual resident outside the United States and employed by other than a United States person), any domestic concern (including any permanent domestic establishment of any foreign concern), and any foreign subsidiary or affiliate (including any permanent foreign establishment) of any domestic concern which is controlled in fact by such domestic concern, as determined under regulations of the President.

(B) Certification.

By submitting this offer, the offeror, if a foreign person, company or entity, certifies that it--

- (1) Does not comply with the secondary Arab boycott of Israel; and
- (2) Is not taking or knowingly agreeing to take any action, with respect to the secondary boycott of Israel by Arab countries, which 50 U.S.C. APP. SEC 2407(A) prohibits a United States person from taking.

133. SAACONS 52.236-4820 ORDER OF PRECEDENCE (JAN 1993)

In regard to FAR contract clause 52.214-29, Order of Precedence-Sealed Bidding, the contract drawings are considered to be an attachment to the specifications and are not "other documents, exhibits, and attachments". For the order of precedence between the specifications and drawings, see FAR contract clause 52.236-21, Alternate I.

134. FAR 52.243-7 NOTIFICATION OF CHANGES (APR 1984)

(a) Definitions. "Contracting Officer," as used in this clause, does not include any representative of the Contracting Officer. "Specifically authorized representative (SAR)," as used in this clause, means any person the Contracting Officer has so designated by written notice (a copy of which shall be provided to the Contractor) which shall refer to this subparagraph and shall be issued to the designated representative before the SAR exercises such authority.

(b) Notice. The primary purpose of this clause is to obtain prompt reporting of Government conduct that the Contractor considers to constitute a change to this contract. Except for changes identified as such in writing and signed by the Contracting Officer, the Contractor shall notify the Administrative Contracting Officer in writing promptly, within 14 calendar days from the date that the Contractor identifies any Government conduct (including actions, inactions, and written or oral communications) that the Contractor regards as a change to the contract terms and conditions. On the basis of the most accurate information available to the Contractor, the notice shall state--

- (1) The date, nature, and circumstances of the conduct regarded as a change;
- (2) The name, function, and activity of each Government individual and Contractor official or employee involved in or knowledgeable about such conduct;
- (3) The identification of any documents and the substance of any oral communication involved in such conduct;
- (4) In the instance of alleged acceleration of scheduled performance or delivery, the basis upon which it arose;
- (5) The particular elements of contract performance for which the Contractor may seek an equitable adjustment under this clause, including--
 - (i) What contract line items have been or may be affected by the alleged change;
 - (ii) What labor or materials or both have been or may be added, deleted, or wasted by the alleged change;
 - (iii) To the extent practicable, what delay and disruption in the manner and sequence of performance and effect on continued performance have been or may be caused by the alleged change;
 - (iv) What adjustments to contract price, delivery schedule, and other provisions affected by the alleged change are estimated; and
- (6) The Contractor's estimate of the time by which the Government must respond to the Contractor's notice to minimize cost, delay or disruption of performance.

(c) Continued performance. Following submission of the notice required by (b) above, the Contractor shall diligently continue performance of this contract to the maximum extent possible in accordance with its terms and conditions as construed by the Contractor, unless the notice reports a direction of the Contracting Officer or a communication from a SAR of the

Contracting Officer, in either of which events the Contractor shall continue performance; provided, however, that if the Contractor regards the direction or communication as a change as described in (b) above, notice shall be given in the manner provided. All directions, communications, interpretations, orders and similar actions of the SAR shall be reduced to writing promptly and copies furnished to the Contractor and to the Contracting Officer. The Contracting Officer shall promptly countermand any action which exceeds the authority of the SAR.

(d) Government response. The Contracting Officer shall promptly, within 14 calendar days after receipt of notice, respond to the notice in writing. In responding, the Contracting Officer shall either--

(1) Confirm that the conduct of which the Contractor gave notice constitutes a change and when necessary direct the mode of further performance;

(2) Countermand any communication regarded as a change;

(3) Deny that the conduct of which the Contractor gave notice constitutes a change and when necessary direct the mode of further performance; or

(4) In the event the Contractor's notice information is inadequate to make a decision under (1), (2), or (3) above, advise the Contractor what additional information is required, and establish the date by which it should be furnished and the date thereafter by which the Government will respond.

(e) Equitable adjustments.

(1) If the Contracting Officer confirms that Government conduct effected a change as alleged by the Contractor, and the conduct causes an increase or decrease in the Contractor's cost of, or the time required for, performance of any part of the work under this contract, whether changed or not changed by such conduct, an equitable adjustment shall be made--

(i) In the contract price or delivery schedule or both; and

(ii) In such other provisions of the contract as may be affected.

(2) The contract shall be modified in writing accordingly. In the case of drawings, designs or specifications which are defective and for which the Government is responsible, the equitable adjustment shall include the cost and time extension for delay reasonably incurred by the Contractor in attempting to comply with the defective drawings, designs or specifications before the Contractor identified, or reasonably should have identified, such defect. When the cost of property made obsolete or excess as a result of a change confirmed by the Contracting Officer under this clause is included in the equitable adjustment, the Contracting Officer shall have the right to prescribe the manner of disposition of the property. The equitable adjustment shall not include increased costs or time extensions for delay resulting from the Contractor's failure to provide notice or to continue performance as provided, respectively, in (b) and (c) above.

135. DFARS 252.247-7023

TRANSPORTATION OF SUPPLIES BY SEA (NOV 1995)

(a) Definitions. As used in this clause--

(1) "Components" means articles, materials, and supplies incorporated directly into end products at any level of manufacture, fabrication, or assembly by the Contractor or any subcontractor.

(2) "Department of Defense (DoD)" means the Army, Navy, Air Force, Marine Corps, and defense agencies.

(3) "Foreign flag vessel" means any vessel that is not a U.S.-flag vessel.

(4) "Ocean transportation" means any transportation aboard a ship, vessel, boat, barge, or ferry through international waters.

(5) "Subcontractor" means a supplier, materialman, distributor, or vendor at any level below the prime Contractor whose contractual obligation to perform results from, or is conditioned upon, award of the prime contract and who is performing any part of the work or other requirement of the prime contract. However, effective May 1, 1996, the term does not include a supplier, materialman, distributor, or vendor of commercial items or commercial components.

(6) "Supplies" means all property, except land and interests in land, that is clearly identifiable for eventual use by or owned by the DoD at the time of transportation by sea.

(i) An item is clearly identifiable for eventual use by the DoD if, for example, the contract documentation contains a reference to a DoD contract number or a military destination.

(ii) Supplies includes (but is not limited to) public works; buildings and facilities; ships; floating equipment and vessels of every character, type, and description, with parts, subassemblies, accessories, and equipment; machine tools; material; equipment; stores of all kinds; end items; construction materials; and components of the foregoing.

(7) "U.S.-flag vessel" means a vessel of the United States or belonging to the United States, including any vessel registered or having national status under the laws of the United States.

(b) The Contractor shall employ U.S.-flag vessels in the transportation by sea of any supplies to be furnished in the performance of this contract. The Contractor and its subcontractors may request that the Contracting Officer authorize shipment in foreign-flag vessels, or designate available U.S.-flag vessels, if the Contractor or a subcontractor believes that--

(1) U.S.-flag vessels are not available for timely shipment;

(2) The freight charges are inordinately excessive or unreasonable; or

(3) Freight charges are higher than charges to private persons for transportation of like goods.

(c) The Contractor must submit any request for use of other than U.S.-flag vessels in writing to the Contracting Officer at least 45 days prior to the sailing date necessary to meet its delivery schedules. The Contracting Officer will process requests submitted after such date(s) as expeditiously as possible, but the Contracting Officer's failure to grant approvals to meet the shipper's sailing date will not of itself constitute a compensable delay under this or any other clause of this contract. Requests shall contain at a minimum--

(1) Type, weight, and cube of cargo;

(2) Required shipping date;

(3) Special handling and discharge requirements;

(4) Loading and discharge points;

(5) Name of shipper and consignee;

(6) Prime contract number; and

(7) A documented description of efforts made to secure U.S.-flag vessels, including points of contact (with names and telephone numbers) with at least two U.S.-flag carriers contacted. Copies of telephone notes, telegraphic and facsimile message or letters will be sufficient for this purpose.

(d) The Contractor shall, within 30 days after each shipment covered by this clause, provide the Contracting Officer and the Division of National Cargo, Office of Market Development, Maritime Administration, U.S. Department of Transportation, Washington, DC 20590, one copy of the rated on board vessel operating carrier's ocean bill of lading, which shall contain the following information--

(1) Prime contract number;

(2) Name of vessel;

(3) Vessel flag of registry;

(4) Date of loading;

(5) Port of loading;

(6) Port of final discharge;

(7) Description of commodity;

(8) Gross weight in pounds and cubic feet if available;

(9) Total ocean freight in U.S. dollars; and

(10) Name of the steamship company.

(e) The Contractor agrees to provide with its final invoice under this contract a representation that to the best of its knowledge and belief--

(1) No ocean transportation was used in the performance of this contract;

(2) Ocean transportation was used and only U.S.-flag vessels were used for all ocean shipments under the contract;

(3) Ocean transportation was used, and the Contractor had the written consent of the Contracting Officer for all non-U.S.-flag ocean transportation; or

(4) Ocean transportation was used and some or all of the shipments were made on non-U.S.-flag vessels without the written consent of the Contracting Officer. The Contractor shall describe these shipments in the following format:

	Item Description	Contract Line Items	Quantity
Total....			

(f) If the final invoice does not include the required representation, the Government will reject and return it to the Contractor as an improper invoice for the purposes of the Prompt Payment clause of this contract. In the event there has been unauthorized use of non-U.S.-flag vessels in the performance of this contract, the Contracting Officer is entitled to equitably adjust the contract, based on the unauthorized use.

(g) The Contractor shall include this clause, including this paragraph (g) in all subcontracts under this contract, which exceed the simplified acquisition threshold in Part 13 of the Federal Acquisition Regulation.

136. FAR 52.252-4 ALTERATIONS IN CONTRACT (APR 1984)

Portions of this contract are altered as follows: None

137. FAR 52.252-6 AUTHORIZED DEVIATIONS IN CLAUSES (APR 1984)

(a) The use in this solicitation or contract of any Federal Acquisition Regulation (48 CFR Chapter 1) clause with an authorized deviation is indicated by the addition of "(DEVIATION)" after the date of the clause.

(b) The use in this solicitation or contract of any Department of Defense FAR Supplement (48 CFR Chapter 2) clause with an authorized deviation is indicated by the addition of "(DEVIATION)" after the name of the regulation.

138. DFARS 252.223-7004 DRUG-FREE WORK FORCE (SEP 1988)

(a) Definitions.

(1) "Employee in a sensitive position," as used in this clause, means an employee who has been granted access to classified information; or employees in other positions that the Contractor determines involve national security, health or safety, or functions other than the foregoing requiring a high degree of trust and confidence.

(2) "Illegal drugs," as used in this clause, means controlled substances included in Schedules I and II, as defined by section 802(6) of Title 21 of the United States Code, the possession of which is unlawful under Chapter 13 of that Title. The term "illegal drugs" does not mean the use of a controlled substance pursuant to a valid prescription or other uses authorized by law.

(b) The Contractor agrees to institute and maintain a program for achieving the objective of a drug-free work force. While this clause defines criteria for such a program, contractors are encouraged to implement alternative approaches comparable to the criteria in paragraph (c) that are designed to achieve the objectives of this clause.

(c) Contractor programs shall include the following, or appropriate alternatives:

(1) Employee assistance programs emphasizing high level direction, education, counseling, rehabilitation, and coordination with available community resources;

(2) Supervisory training to assist in identifying and addressing illegal drug use by Contractor employees;

(3) Provisions for self-referrals as well as supervisory referrals to treatment with maximum respect for individual confidentiality consistent with safety and security issues;

(4) Provision for identifying illegal drug users, including testing on a controlled and carefully monitored basis. Employee drug testing programs shall be established taking account of the following:

(i) The Contractor shall establish a program that provides for testing for the use of illegal drugs by employees in sensitive positions. The extent of and criteria for such testing shall be determined by the Contractor based on considerations that include the nature of the work being performed under the contract, the employee's duties, the efficient use of Contractor resources, and the risks to health, safety, or national security that could result from the failure of an employee adequately to discharge his or her position.

(ii) In addition, the Contractor may establish a program for employee drug testing--

(A) When there is a reasonable suspicion that an employee uses illegal drugs; or

(B) When an employee has been involved in an accident or unsafe practice;

(C) As part of or as a follow-up to counseling or rehabilitation for illegal drug use;

(D) As part of a voluntary employee drug testing program

(iii) The Contractor may establish a program to test applicants for employment for illegal drug use.

(iv) For the purpose of administering this clause, testing for illegal drugs may be limited to those substances for which testing is prescribed by section 2.1 of Subpart B of the "Mandatory Guidelines for Federal Workplace Drug Testing Programs" (53FR 11980 (April 11, 1988)), issued by the Department of Health and Human Services.

(d) Contractors shall adopt appropriate personnel procedures to deal with employees who are found to be using drugs illegally. Contractors shall not allow any employee to remain on duty or perform in a sensitive position who is found to use illegal drugs until such time as the Contractor, in accordance with procedures established by the Contractor, determines that the employee may perform in such a position.

(e) The provisions of this clause pertaining to drug testing programs shall not apply to the extent they are inconsistent with state or local law, or with an existing collective bargaining agreement; provided that with respect to the latter, the Contractor agrees that those issues that are in conflict will be a subject of negotiation at the next collective bargaining session.

139. EFARS 52.249-5000

BASIS FOR SETTLEMENT OF PROPOSALS (DEC 1995)

Actual costs will be used to determine equipment costs for a settlement proposal submitted on the total cost basis under FAR 49.206-2(b). In evaluating a termination settlement proposal using the total cost basis, the following principles will be applied to determine allowable equipment costs:

(1) Actual costs for each piece of equipment or groups of similar serial or series equipment need not be available in the Contractor's accounting records to determine total actual equipment costs.

(2) If equipment costs have been allocated to a contract using predetermined rates, those charges will be adjusted to actual costs.

(3) Recorded job costs adjusted for unallowable expenses will be used to determine equipment operating expenses.

(4) Ownership costs (depreciation) will be determined using the Contractor's depreciation schedule (subject to the provisions of FAR 31.205-11).

(5) License, taxes, storage and insurance costs are normally recovered as an indirect expense and unless the Contractor charges these costs directly to contracts, they will be recovered through the indirect expense rate.

END OF SECTION

SECTION 00800
SPECIAL CONTRACT REQUIREMENTS

SECTION 00800

SPECIAL CONTRACT REQUIREMENTS

1. FAR 52.252-1 SOLICITATION PROVISIONS INCORPORATED BY
REFERENCE (JUN 1988)

This solicitation incorporates one or more solicitation provisions by reference, with the same force and effect as if they were given in full text. Upon request, the Contracting Officer will make their full text available.

SOLICITATION PROVISIONS BY REFERENCE:

2. FAR 52.211-13 TIME EXTENSIONS (APR 1984)
3. FAR 52.223-14 TOXIC CHEMICAL RELEASE REPORTING (OCT 1996)
4. FAR 52.228-5 INSURANCE--WORK ON A GOVERNMENT INSTALLATION
(JAN 1997)
5. FAR 52.246-12 INSPECTION OF CONSTRUCTION (AUG 1996)

THE FOLLOWING SOLICITATION PROVISIONS ARE INCLUDED IN FULL TEXT

6. FAR 52.204-4 PRINTING/COPYING DOUBLE-SIDED ON RECYCLED PAPER
(JUN 1996)
7. DFARS 252.204-7003 CONTROL OF GOVERNMENT PERSONNEL
WORK PRODUCT (APR 1992)
8. FAR 52.211-10 COMMENCEMENT, PROSECUTION, AND COMPLETION
OF WORK (APR 1994)
9. FAR 52.211-12 LIQUIDATED DAMAGES--CONSTRUCTION
(APR 1984)
10. SAACONS 52.0211.4853 WORK DAYS AND HOURS (APR 1992)
11. SAACONS 52.0215-4101 ALTERNATE STRUCTURED APPROACH TO WEIGHTED
GUIDELINE METHOD FOR CONSTRUCTION CONTRACTS
(EFARS 15.973-100) (MAY 1995)
12. SAACONS 52.0219-4509 SUBCONTRACTING WITH SMALL, SMALL DISADVANTAGED
AND WOMEN-OWNED SMALL BUSINESSES (JAN 1996)
13. DFARS 252.223-7006 PROHIBITION ON STORAGE AND DISPOSAL OF TOXIC AND
HAZARDOUS MATERIALS
(APR 1993)
14. SAACONS 52.0223-4803 HAZARDOUS MATERIALS DELIVERED UNDER THIS
CONTRACT (MAY 1993)
15. SAACONS 52.0228-4502 MINIMUM INSURANCE REQUIRED (MAY 1993)
16. EFARS 52.231-5000 EQUIPMENT OWNERSHIP AND OPERATING
EXPENSE SCHEDULE (MAR 1995)--EFARS
17. FAR 52.232-27 PROMPT PAYMENT FOR CONSTRUCTION CONTRACTS
(MAR 1994)
18. DFARS 252.232-7006 REDUCTION OR SUSPENSION OF CONTRACT PAYMENTS
UPON FINDING OF FRAUD
(AUG 1992)
19. FAR 52.236-1 PERFORMANCE OF WORK BY THE CONTRACTOR
(APR 1984)
20. FAR 52.236-4 PHYSICAL DATA (APR 1984)
21. DFARS 252.236-7001 CONTRACT DRAWINGS, MAPS, AND SPECIFICATIONS
(DEC 1991)

- 22. SAACONS 52.0236-4801 SALVAGE AND SCRAP GOVERNMENT PROPERTY
(OCT 1993)
- 23. SAACONS 52.0236-4581 AVAILABILITY OF UTILITIES SERVICES
(APR 1992)
- 24. FAR 52.245-3 IDENTIFICATION OF GOVERNMENT-FURNISHED PROPERTY
(APR 1984)

FULL TEXT SOLICITATION PROVISIONS:

6. FAR 52.204-4 PRINTING/COPYING DOUBLE-SIDED ON RECYCLED PAPER
(JUN 1996)

(a) In accordance with Executive Order 12873, dated October 20, 1993, as amended by Executive Order 12995, dated March 25, 1996, the Offeror/Contractor is encouraged to submit paper documents, such as offers, letters, or reports, that are printed/copied double-sided on recycled paper that has at least 20% postconsumer material.

(b) The 20% standard applies to high-speed copies paper, offset paper, forms bond, computer printout paper, and carbonless paper, file folders, white woven envelopes, and other uncoated printed and writing paper, such as writing and office paper, book paper, cotton fiber paper, and cover stock. An alternative to meeting the 20 % postconsumer material standard is 50 % recovered material content of certain industrial by-products.

7. DFARS 252.204-7003 CONTROL OF GOVERNMENT PERSONNEL
WORK PRODUCT (APR 1992)

The Contractor's procedures for protecting against unauthorized disclosure of information shall not require Department of Defense employees or members of the Armed Forces to relinquish control of their work products, whether classified or not, to the Contractor.

8. FAR 52.211-10 COMMENCEMENT, PROSECUTION, AND COMPLETION
OF WORK (APR 1994)

The Contractor shall be required to (a) commence work under this contract within **(10)** calendar days after the date the Contractor receives the notice to proceed, (b) prosecute the work diligently, and (c) complete the entire work ready for use not later than 540 calendar days after receipt of notice to proceed. The time stated for completion shall include final cleanup of the premises.

9. FAR 52.211-12 LIQUIDATED DAMAGES--CONSTRUCTION
(APR 1984)

(a) If the Contractor fails to complete the work within the time specified in the contract, or any extension, the Contractor shall pay to the Government as liquidated damages, the sum of \$915 for each day of delay.

(b) If the Government terminates the Contractor's right to proceed, the resulting damage will consist of liquidated damages until such reasonable time as may be required for final completion of the work together with any increased costs occasioned the Government in completing the work.

(c) If the Government does not terminate the Contractor's right to proceed, the resulting damage will consist of liquidated damages until the work is completed or accepted.

10. SAACONS 52.0211.4853 WORK DAYS AND HOURS (APR 1992)

The normal work days and hours for this project will be Monday through Friday, excluding federal holidays, from 7:30 a.m. to 4:00 p.m. Access to the work site may be restricted to these hours and days. Work during other than normal hours and days must be coordinated in advance with the Administrative Contracting Officer.

11. SAACONS 52.0215-4101 ALTERNATE STRUCTURED APPROACH TO WEIGHTED
GUIDELINE METHOD FOR CONSTRUCTION CONTRACTS
(EFARS 15.973-100) (MAY 1995)

The following alternate structured approach shall be used for all fixed-price construction contract actions.

<u>Factor</u>	<u>Rate</u>	<u>Weight</u>	<u>Value</u>
Degree of risk	20		
Relative difficulty of work	15		
Size of job	15		
Period of performance	15		
Contractor's investment	5		
Assistance by Government	5		
Subcontracting	25		
Total	100%		

Based on the circumstances of the procurement action, each of the above factors shall be weighted from .03 to .12 as indicated below. "Value shall be obtained by multiplying the rate by the weight. The Value column when totaled indicates the fair and reasonable profit percentage under the circumstances of the particular procurement. The profit percentage should be multiplied by the total contract costs, including general and administrative costs.

(1) Degree of risk. Where the work involves no risk or the degree of risk is very small, the weighting should be .03; as the degree of risk increases, the weighting should be increased up to a maximum of .12. Lump sum items shall generally have a higher weight than unit price items; other things to consider include the nature of the work and where it is to be performed. Consider the portion of the work to be done by subcontractors, amount and type of labor included in costs, whether the negotiation is before or after performance of the work, etc. Modifications settled before the fact have much greater risk than those settled after the fact. A weight of .03 is appropriate for after the fact equitable adjustments and/or settlements.

(2) Relative Difficulty of Work: If the work is difficult and complex, the weight should be .12 and should be proportionately reduced to .03 on the simplest of jobs. This factor is tied in to some extent with the degree of risk. Some other things to consider are the nature of the work, by whom it is to be done (i.e., subcontractors, consultants), what is the time schedule.

(3) Size of Job. Work of \$100,000 or less shall be weighted at .12. Work estimated between \$100,000 and \$5,000,000 shall be proportionately weighted from .12 to .05. Work from \$5,000,000 to \$10,000,000 shall be weighted at .04. Work in excess of \$10,000,000 shall be weighted at .03. It should be noted that control of fixed expenses generally improves with increased job magnitude.

(4) Period of Performance. Work not to exceed one month is to be proportionately weighted at .03. Work in excess of 24 months is to be weighted at .12. Durations between one month and 24 months are to be proportionately weighted between .03 and .12.

(5) Contractor's Investment. To be weighted from .03 to .12 on the basis of below average, average and above average. Things to consider include amount of subcontracting, Government-furnished property or data such as surveys, soil tests, method of making progress payments, and any mobilization payment items.

(6) Assistance by Government. To be weighted from .12 to .03 on the basis of average to above average. Consider use of Government-owned property, equipment and facilities, and expediting assistance.

(7) Subcontracting. To be weighted inversely proportional to the amount of subcontracting. Where 80% or more of the work is to be subcontracted use .03. The weighting should be increased proportionately to .12 where all the work is performed by the contractor's own forces.

12. SAACONS 52.0219-4509 SUBCONTRACTING WITH SMALL, SMALL DISADVANTAGED AND WOMEN-OWNED SMALL BUSINESSES (JAN 1996)

Contractors are cautioned that failure of any Contractor to comply in good faith with the Contract Clauses titled (1) Utilization of Small, Small Disadvantaged and Women-Owned Small Business Concerns or (2) Small, Small Disadvantaged and Women-Owned Small Business Subcontracting Plan, when applicable, will be a material breach of contract. In order to assist contractors in developing a source list of small, small disadvantaged and/or women-owned small business concerns you are encouraged to contact your minority contractor associates, the local Minority Business Development Agency and the appropriate General Business Service Centers in your Standard Metropolitan Statistical Area. Contractors may obtain addresses of these sources from:

Write: US Army Engineer District, Sacramento
ATTN: Contracting Division, Deputy for Small Business
1325 J Street, 8th Floor
Sacramento, California 95814-2922

Or Contact: Mr. John Szabo
Deputy for Small Business
Telephone: (916) 557-5202

13. DFARS 252.223-7006 PROHIBITION ON STORAGE AND DISPOSAL OF TOXIC AND HAZARDOUS MATERIALS (APR 1993)

(a) Definitions. As used in this clause--

(1) "Storage" means a non-transitory, semi-permanent or permanent holding, placement, or leaving of material. It does not include a temporary accumulation of a limited quantity of a material used in or a waste generated or resulting from authorized activities, such as servicing, maintenance, or repair of Department of Defense (DoD) items, equipment, or facilities.

(2) "Toxic or hazardous materials" means:

(i) Materials referred to in section 101(14) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 (42 U.S.C. 9601(14)) and materials designated under section 102 of CERCLA (42 U.S.C. 9602 (40 CFR Part 302);

(ii) Materials that are of an explosive, flammable, or pyrotechnic nature; or

(iii) Materials otherwise identified by the Secretary of Defense as specified in DoD regulations.

(b) In accordance with 10 U.S.C. 2692, the Contractor is prohibited from storing or disposing of non-DoD-owned toxic or hazardous materials on a DoD installation, except to the extent authorized by a statutory exception to 10 U.S.C. 2692 or as authorized by the Secretary of Defense or his designee.

14. SAACONS 52.0223-4803 HAZARDOUS MATERIALS DELIVERED UNDER THIS CONTRACT (MAY 1993)

(a) If any hazardous materials will be delivered under this contract (see Section 00600, FAR 52.223-3, and DFARS 252.223-7001), the Material Safety Data Sheets (MSDS) for locally purchased, nonstandard stock hazardous material

will be submitted to the Corps of Engineers Contracting Officer or Contracting Officer's Representative. For all other materials, the MSDS will also be submitted to U.S. Army Environmental Hygiene Agency, ATTN: HSE-OI, Aberdeen Proving Grounds MD 21010.

(b) Hazardous material is defined in Federal Standard No. 313, sold by the General Services Administration Specifications Unit (3FBP-W), 7th & D Streets, SW, Washington DC 20407.

15. SAACONS 52.0228-4502 MINIMUM INSURANCE REQUIRED (MAY 1993)

The contract clause, FAR 52.228-5, applies to this contract even if the work or any portion of the work is not performed on a Government installation. In accordance with FAR 52.228-5 and FAR 28.307-2, the contractor shall procure and thereafter maintain during the entire period of this performance under this contract the following minimum insurance.

TYPE	AMOUNT
Worker's Compensation and Employer's Liability	Comply with Federal and State worker's comp and occupational disease statutes. Employer's liability of at least \$100,000
General Liability (Comprehensive)	Bodily injury liability of at least \$500,000 per occurrence.
Automobile Liability (Comprehensive):	
Bodily Injury	At least \$200,000 per person
&	and \$500,000 per occurrence.
Property Damage	At least \$20,000 per occurrence.
Longshoremen's and Harbor Worker's Compensation (When applicable by location of contract performance)	Coverage complying with applicable Federal statute (33 USC 901 et seq).

16. EFARS 52.231-5000 EQUIPMENT OWNERSHIP AND OPERATING
EXPENSE SCHEDULE (MAR 1995)--EFARS

(a) This statement shall become operative only for negotiated contracts where cost or pricing data is requested, and for modifications to sealed bid or negotiated contracts where cost or pricing data is requested. This clause does not apply to terminations. See 52.249-5000, Basis for Settlement of Proposals, and FAR Part 49.

(b) Allowable cost for CONSTRUCTION and marine plant and equipment in sound workable condition owned or controlled and furnished by a contractor or subcontractor at any tier shall be based on actual cost data for each piece of equipment or groups of similar serial and series for which the Government can determine both ownership and operating costs from the contractor's accounting records. When both ownership and operating costs cannot be determined for any piece of equipment or groups of similar serial or series equipment from the contractor's accounting records, costs for that equipment shall be based upon the applicable provisions of EP 1110-1-8, CONSTRUCTION Equipment Ownership and Operating Expense Schedule, Region VII. Working conditions shall be considered to be average for determining equipment rates using the schedule unless specified otherwise by the contracting officer. For equipment not

included in the schedule, rates for comparable pieces of equipment may be used or a rate may be developed using the formula provided in the schedule. For forward pricing, the schedule in effect at the time of negotiations shall apply. For retroactive pricing, the schedule in effect at the time the work was performed shall apply.

(c) Equipment rental costs are allowable, subject to the provisions of FAR 31.105(d)(ii) and FAR 31.205-36. Rates for equipment rented from an organization under common control, lease-purchase arrangements, and sale-leaseback arrangements, will be determined using the schedule, except that actual rates will be used for equipment leased from an organization under common control that has an established practice of leasing the same or similar equipment to unaffiliated lessees.

(d) When actual equipment costs are proposed and the total amount of the pricing action exceeds the small purchase threshold, the contracting officer shall request the contractor to submit either certified cost or pricing data, or partial/limited data, as appropriate. The data shall be submitted on Standard Form 1411, Contract Pricing Proposal Cover Sheet.

NOTE: See also, Specification Section 01500. A copy of the EP 1110-1-8 is available for review in the Corps of Engineers, Sacramento District Office, 1325 J Street, Library, 8th floor, telephone (916) 557-6657. Copies are available for a nominal charge from the Government Printing Office, telephone (202) 783-3238.

17. FAR 52.232-27

PROMPT PAYMENT FOR CONSTRUCTION CONTRACTS
(MAR 1994)

Notwithstanding any other payment terms in this contract, the Government will make invoice payments and contract financing payments under the terms and conditions specified in this clause. Payment shall be considered as being made on the day a check is dated or an electronic funds transfer is made. Definitions of pertinent terms are set forth in 32.902. All days referred to in this clause are calendar days, unless otherwise specified.

(a) Invoice Payments.

(1) For purposes of this clause, there are several types of invoice payments which may occur under this contract, as follows:

(i) Progress payments, if provided for elsewhere in this contract, based on Contracting Officer approval of the estimated amount and value of work or services performed, including payments for reaching milestones in any project:

(A) The due date for making such payments shall be 25 days after receipt of the payment request by the designated billing office. However, if the designated billing office fails to annotate the payment request with the actual date of receipt, the payment due date shall be deemed to be the 25th day after the date the Contractor's payment request is dated, provided a proper payment request is received and there is no disagreement over quantity, quality, or Contractor compliance with contract requirements.

(B) The due date for payment of any amounts retained by the Contracting Officer in accordance with the clause at 52.232-5, Payments Under Fixed-Price CONSTRUCTION Contracts, shall be as specified in the contract or, if not specified, 30 days after approval for release to the Contractor by the Contracting Officer.

(ii) Final payments based on completion and acceptance of all work and presentation of release of all claims against the Government arising by virtue of the contract, and payments for partial deliveries that have been accepted by the Government (e.g., each separate building, public work, or other division of the contract for which the price is stated separately in the contract):

(A) The due date for making such payments shall be either the 30th day after receipt by the designated billing office of a proper invoice from the

Contractor, or the 30th day after Government acceptance of the work or services completed by the Contractor, whichever is later. However, if the designated billing office fails to annotate the invoice with the date of actual receipt, the invoice payment due date shall be deemed to be the 30th day after the date the Contractor's invoice is dated, provided a proper invoice is received and there is no disagreement over quantity, quality, or Contractor compliance with contract requirements.

(B) On a final invoice where the payment amount is subject to contract settlement actions (e.g., release of claims), acceptance shall be deemed to have occurred on the effective date of the contract settlement.

(2) An invoice is the Contractor's bill or written request for payment under the contract for work or services performed under the contract. An invoice shall be prepared and submitted to the designated billing office. A proper invoice must include the items listed in subdivisions (a)(2)(i) through (a)(2)(ix) of this clause. If the invoice does not comply with these requirements, the Contractor will be notified of the defect within 7 days after receipt of the invoice at the designated billing office. Untimely notification will be taken into account in the computation of any interest penalty owed the Contractor in the manner described in subparagraph (a)(4) of this clause:

- (i) Name and address of the Contractor.
- (ii) Invoice date.
- (iii) Contract number or other authorization for work or services performed (including order number and contract line item number).
- (iv) Description of work or services performed.
- (v) Delivery and payment terms (e.g., prompt payment discount terms).
- (vi) Name and address of Contractor official to whom payment is to be sent (must be the same as that in the contract or in a proper notice of assignment).
- (vii) Name (where practicable), title, phone number, and mailing address of person to be notified in event of a defective invoice.
- (viii) For payments described in subdivision (a)(1)(i) of this clause, substantiation of the amounts requested and certification in accordance with the requirements of the clause at 52.232-5, Payments Under Fixed-Price CONSTRUCTION Contracts.
- (ix) Any other information or documentation required by the contract.

(3) An interest penalty shall be paid automatically by the designated payment office, without request from the Contractor, if payment is not made by the due date and the conditions listed in subdivisions (a)(3)(i) through (a)(3)(iii) of this clause are met, if applicable.

- (i) A proper invoice was received by the designated billing office.
- (ii) A receiving report or other Government documentation authorizing payment was processed and there was no disagreement over quantity, quality, Contractor compliance with any contract term or condition, or requested progress payment amount.
- (iii) In the case of a final invoice for any balance of funds due the Contractor for work or services performed, the amount was not subject to further contract settlement actions between the Government and the Contractor.

(4) The interest penalty shall be at the rate established by the Secretary of the Treasury under section 12 of the Contract Disputes Act of 1978 (41 U.S.C. 611) that is in effect on the day after the due date, except where the interest penalty is prescribed by other governmental authority. This rate is referred to as the "Renegotiation Board Interest Rate," and it is published in the Federal Register semiannually on or about January 1 and July 1. The interest penalty shall accrue daily on the invoice payment amount approved by the Government and be compounded in 30-day increments inclusive from the first day after the due date through the payment date. That is, interest accrued at the end of any 30-day period will be added to the approved invoice payment amount and be subject to interest penalties if not paid in the

succeeding 30-day period. If the designated billing office failed to notify the Contractor of a defective invoice within the periods prescribed in subparagraph (a)(2) of this clause, then the due date on the corrected invoice will be adjusted by subtracting the number of days taken beyond the prescribed notification of defects period. Any interest penalty owed the Contractor will be based on this adjusted due date. Adjustments will be made by the designated payment office for errors in calculating interest penalties, if requested by the Contractor.

(i) For the sole purpose of computing an interest penalty that might be due the Contractor for payments described in subdivision (a)(1)(ii) of this clause, Government acceptance or approval shall be deemed to have occurred constructively on the 7th day after the Contractor has completed the work or services in accordance with the terms and conditions of the contract. In the event that actual acceptance or approval occurs within the constructive acceptance or approval period, the determination of an interest penalty shall be based on the actual date of acceptance or approval. Constructive acceptance or constructive approval requirements do not apply if there is a disagreement over quantity, quality, or Contractor compliance with a contract provision. These requirements also do not compel Government officials to accept work or services, approve Contractor estimates, perform contract administration functions, or make payment prior to fulfilling their responsibilities.

(ii) The following periods of time will not be included in the determination of an interest penalty:

(A) The period taken to notify the Contractor of defects in invoices submitted to the Government, but this may not exceed 7 days.

(B) The period between the defects notice and resubmission of the corrected invoice by the Contractor.

(iii) Interest penalties will not continue to accrue after the filing of a claim for such penalties under the clause at 52.233-1, Disputes, or for more than 1 year. Interest penalties of less than \$1.00 need not be paid.

(iv) Interest penalties are not required on payment delays due to disagreement between the Government and Contractor over the payment amount or other issues involving contract compliance, or on amounts temporarily withheld or retained in accordance with the terms of the contract. Claims involving disputes, and any interest that may be payable, will be resolved in accordance with the clause at 52.233-1, Disputes.

(5) An interest penalty shall also be paid automatically by the designated payment office, without request from the Contractor, if a discount for prompt payment is taken improperly. The interest penalty will be calculated on the amount of discount taken for the period beginning with the first day after the end of the discount period through the date when the Contractor is paid.

(6) If this contract was awarded on or after October 1, 1989, a penalty amount, calculated in accordance with regulations issued by the Office of Management and Budget, shall be paid in addition to the interest penalty amount if the Contractor--

(i) Is owed an interest penalty;

(ii) Is not paid the interest penalty within 10 days after the date the invoice amount is paid; and

(iii) Makes a written demand, not later than 40 days after the date the invoice amount is paid, that the agency pay such a penalty.

(b) Contract Financing Payments.

(1) For purposes of this clause, if applicable, "contract financing payment" means a Government disbursement of monies to a Contractor under a contract clause or other authorization prior to acceptance of supplies or services by the Government, other than progress payments based on estimates of amount and value of work performed. Contract financing payments include advance payments and interim payments under cost-type contracts.

(2) If this contract provides for contract financing, requests for payment shall be submitted to the designated billing office as specified in this contract or as directed by the Contracting Officer. Contract financing payments shall be made on the 30th day after receipt of a proper contract financing request by the designated billing office. In the event that an audit or other review of a specific financing request is required to ensure compliance with the terms and conditions of the contract, the designated payment office is not compelled to make payment by the due date specified. For advance payments, loans, or other arrangements that do not involve recurrent submissions of contract financing requests, payment shall be made in accordance with the corresponding contract terms or as directed by the Contracting Officer. Contract financing payments shall not be assessed an interest penalty for payment delays.

(c) The Contractor shall include in each subcontract for property or services (including a material supplier) for the purpose of performing this contract the following:

(1) A payment clause which obligates the Contractor to pay the subcontractor for satisfactory performance under its subcontract not later than 7 days from receipt of payment out of such amounts as are paid to the Contractor under this contract.

(2) An interest penalty clause which obligates the Contractor to pay to the subcontractor an interest penalty for each payment not made in accordance with the payment clause--

(i) For the period beginning on the day after the required payment date and ending on the date on which payment of the amount due is made; and

(ii) Computed at the rate of interest established by the Secretary of the Treasury, and published in the Federal Register, for interest payments under section 12 of the Contract Disputes Act of 1978 (41 U.S.C. 611) in effect at the time the Contractor accrues the obligation to pay an interest penalty.

(3) A clause requiring each subcontractor to include a payment clause and an interest penalty clause conforming to the standards set forth in subparagraphs (c)(1) and (c)(2) of this clause in each of its subcontracts, and to require each of its subcontractors to include such clauses in their subcontracts with each lower-tier subcontractor or supplier.

(d) The clauses required by paragraph (c) of this clause shall not be construed to impair the right of Contractor or a subcontractor at any tier to negotiate, and to include in their subcontract, provisions which--

(1) Permit the Contractor or a subcontractor to retain (without cause) a specified percentage of each progress payment otherwise due to a subcontractor for satisfactory performance under the subcontract without incurring any obligation to pay a late payment interest penalty, in accordance with terms and conditions agreed to by the parties to the subcontract, giving such recognition as the parties deem appropriate to the ability of a subcontractor to furnish a performance bond and a payment bond;

(2) Permit the Contractor or subcontractor to make a determination that part or all of the subcontractor's request for payment may be withheld in accordance with the subcontract agreement; and

(3) Permit such withholding without incurring any obligation to pay a late payment penalty if--

(i) A notice conforming to the standards of paragraph (g) of this clause has been previously furnished to the subcontractor; and

(ii) A copy of any notice issued by a Contractor pursuant to subdivision (d)(3)(i) of this clause has been furnished to the Contracting Officer.

(e) If a Contractor, after making a request for payment to the Government but before making a payment to a subcontractor for the subcontractor's performance covered by the payment request, discovers that all or a portion of the payment otherwise due such subcontractor is subject to withholding from the subcontractor in accordance with the subcontract agreement, then the Contractor shall--

(1) Furnish to the subcontractor a notice conforming to the standards of paragraph (g) of this clause as soon as practicable upon ascertaining the cause giving rise to a withholding, but prior to the due date for subcontractor payment;

(2) Furnish to the Contracting Officer, as soon as practicable, a copy of the notice furnished to the subcontractor pursuant to subparagraph (e)(1) of this clause;

(3) Reduce the subcontractor's progress payment by an amount not to exceed the amount specified in the notice of withholding furnished under subparagraph (e)(1) of this clause;

(4) Pay the subcontractor as soon as practicable after the correction of the identified subcontract performance deficiency, and--

(i) Make such payment within--

(A) Seven days after correction of the identified subcontract performance deficiency (unless the funds therefor must be recovered from the Government because of a reduction under subdivision (e)(5)(i)) of this clause; or

(B) Seven days after the Contractor recovers such funds from the Government; or

(ii) Incur an obligation to pay a late payment interest penalty computed at the rate of interest established by the Secretary of the Treasury, and published in the Federal Register, for interest payments under section 12 of the Contracts Disputes Act of 1978 (41 U.S.C. 611) in effect at the time the Contractor accrues the obligation to pay an interest penalty;

(5) Notify the Contracting Officer upon--

(i) Reduction of the amount of any subsequent certified application for payment; or

(ii) Payment to the subcontractor of any withheld amounts of a progress payment, specifying--

(A) The amounts withheld under subparagraph (e)(1) of this clause; and

(B) The dates that such withholding began and ended; and

(6) Be obligated to pay to the Government an amount equal to interest on the withheld payments (computed in the manner provided in 31 U.S.C. 3903(c)(1)), from the 8th day after receipt of the withheld amounts from the Government until--

(i) The day the identified subcontractor performance deficiency is corrected; or

(ii) The date that any subsequent payment is reduced under subdivision (e)(5)(i) of this clause.

(f)(1) If a Contractor, after making payment to a first-tier subcontractor, receives from a supplier or subcontractor of the first-tier subcontractor (hereafter referred to as a "second-tier subcontractor") a written notice in accordance with section 2 of the Act of August 24, 1935 (40 U.S.C. 270b, Miller Act), asserting a deficiency in such first-tier subcontractor's performance under the contract for which the Contractor may be ultimately liable, and the Contractor determines that all or a portion of future payments otherwise due such first-tier subcontractor is subject to withholding in accordance with the subcontract agreement, then the Contractor may, without incurring an obligation to pay an interest penalty under subparagraph (e)(6) of this clause--

(i) Furnish to the first-tier subcontractor a notice conforming to the standards of paragraph (g) of this clause as soon as practicable upon making such determination; and

(ii) Withhold from the first-tier subcontractor's next available progress payment or payments an amount not to exceed the amount specified in the notice of withholding furnished under subdivision (f)(1)(i) of this clause.

(2) As soon as practicable, but not later than 7 days after receipt of satisfactory written notification that the identified subcontract performance deficiency has been corrected, the Contractor shall pay the amount withheld under subdivision (f)(1)(ii) of this clause to such first-tier subcontractor,

or shall incur an obligation to pay a late payment interest penalty to such first-tier subcontractor computed at the rate of interest established by the Secretary of the Treasury, and published in the Federal Register, for interest payments under section 12 of the Contracts Disputes Act of 1978 (41 U.S.C. 611) in effect at the time the Contractor accrues the obligation to pay an interest penalty.

(g) A written notice of any withholding shall be issued to a subcontractor (with a copy to the Contracting Officer of any such notice issued by the Contractor), specifying--

(1) The amount to be withheld;

(2) The specific causes for the withholding under the terms of the subcontract; and

(3) The remedial actions to be taken by the subcontractor in order to receive payment of the amounts withheld.

(h) The Contractor may not request payment from the Government of any amount withheld or retained in accordance with paragraph (d) of this clause until such time as the Contractor has determined and certified to the Contracting Officer that the subcontractor is entitled to the payment of such amount.

(i) A dispute between the Contractor and subcontractor relating to the amount or entitlement of a subcontractor to a payment or a late payment interest penalty under a clause included in the subcontract pursuant to paragraph (c) of this clause does not constitute a dispute to which the United States is a party. The United States may not be interpleaded in any judicial or administrative proceeding involving such a dispute.

(j) Except as provided in paragraph (I) of this clause, this clause shall not limit or impair any contractual, administrative, or judicial remedies otherwise available to the Contractor or a subcontractor in the event of a dispute involving late payment or nonpayment by the Contractor or deficient subcontract performance or nonperformance by a subcontractor.

(k) The Contractor's obligation to pay an interest penalty to a subcontractor pursuant to the clauses included in a subcontract under paragraph (c) of this clause shall not be construed to be an obligation of the United States for such interest penalty. A cost reimbursement claim may not include any amount for reimbursement of such interest penalty.

18. DFARS 252.232-7006 REDUCTION OR SUSPENSION OF CONTRACT PAYMENTS
UPON FINDING OF FRAUD
(AUG 1992)

(a) 10 U.S.C. 2307(e) permits the head of the agency to reduce or suspend further payments upon a written determination by the agency head that substantial evidence exists that the Contractor's request for advance, partial, or progress payments is based on fraud. The provisions of 10 U.S.C. 2307(e) are in addition to any other rights or remedies provided the Government by law or under contract.

(b) Actions taken by the Government in accordance with 10 U.S.C. 2307(e) shall not constitute an excusable delay under the Default clause of this contract or otherwise relieve the Contractor of its obligations to perform under this contract.

19. FAR 52.236-1 PERFORMANCE OF WORK BY THE CONTRACTOR
(APR 1984)

The Contractor shall perform on the site, and with its own organization, work equivalent to at least twenty percent of the total amount of work to be performed under the contract. This percentage may be reduced by a supplemental agreement to this contract if, during performing the work, the

Contractor requests a reduction and the Contracting Officer determines that the reduction would be to the advantage of the Government.

20. FAR 52.236-4

PHYSICAL DATA (APR 1984)

Data and information furnished or referred to below is for the Contractor's information. The Government shall not be responsible for any interpretation of or conclusion drawn from the data or information by the Contractor.

(a) The indications of physical conditions on the drawings and in the specifications are the result of site investigations by the Government.

(b) Weather conditions: The Contractor shall satisfy himself/herself as to the hazards likely to arise from weather conditions. Complete weather records and reports may be obtained from any U.S. Weather Bureau Office.

(c) Transportation Facilities: The Contractor shall make his/her own investigation of the conditions of existing public and private roads and of clearances, restrictions, bridge load limits and other limitations affecting transportation and ingress and egress at the job site. The unavailability of transportation facilities or limitations thereon shall not become a basis for claims against the Government or extension of time for completion of the work.

21. DFARS 252.236-7001

CONTRACT DRAWINGS, MAPS, AND SPECIFICATIONS
(DEC 1991)

(a) The Government--

(1) Will provide the Contractor, without charge, one set of large-scale contract drawings and specifications except publications incorporated into the technical provisions by reference;

(2) Will furnish additional sets on request, for the cost of reproduction; and

(3) May, at its option, furnish the Contractor one set of reproduces, or half-size drawings, in lieu of the drawings in paragraph (a)(1) of this clause.

(b) The Contractor shall--

(1) Check all drawings furnished immediately upon receipt;

(2) Compare all drawings and verify the figures before laying out the work;

(3) Promptly notify the Contracting Officer of any discrepancies; and

(4) Be responsible for any errors which might have been avoided by complying with this paragraph (b).

(c) Large scale drawings shall, in general, govern small scale drawings. Figures marked on drawings shall, in general, be followed in preference to scale measurements.

(d) Omissions from the drawings or specifications or the misdescription of details of work which are manifestly necessary to carry out the intent of the drawings and specifications, or which are customarily performed, shall not relieve the Contractor from performing such omitted or misdescribed details of the work, but shall be performed as if fully and correctly set forth and described in the drawings and specifications.

(e) The work shall conform to the specifications and the contract drawings identified on the following index of drawings:

Drawing File No.180-25-770

Sheet No.	Description	Rev. No.
1	TITLE SHEET	
2	SCHEDULE OF DRAWINGS	
3	LOCATION & VICINITY MAPS	
4	SHEET INDEX	
5	TOPOGRAPHIC	
6	TOPOGRAPHIC	
7	TOPOGRAPHIC	
8	TOPOGRAPHIC	
9	TOPOGRAPHIC	
10	LOG OF EXPLORATIONS	
11	LOG OF EXPLORATIONS	
12	DEMOLITION PLAN AND LEGEND & ABBREVIATIONS	
13	DEMOLITION DETAILS	
14	OVERALL SITE PLAN	
15	SITE PLAN	
16	GRADING PLAN	
17	UTILITY PLAN	
18	PLAN & PROFILE	
19	PLAN & PROFILE	
20	SECTIONS	
21	BIRCH STREET SECTION	
22	SITE DETAILS	
23	SITE DETAILS	
24	UTILITY DETAILS	
25	JOINT PLAN	
26	FLOOR PLAN, PAINT SCHEDULE, SYMBOLS, LEGEND & ABBREVIATIONS	
27	EXTERIOR BUILDING ELEVATIONS	
28	LONGITUDINAL REINFORCING SECTIONS	
29	WALL SECTION & DETAILS	
30	WALL SECTIONS	
31	HEAD WALL PLAN & ELEVATION	
32	CANOPY SECTIONS	
33	PLAN COVER PLATES, ENTRIES, MISC. DETAILS	
34	STAIR PLAN, SECTIONS & MISC. DETAILS	
35	ROOF PLAN & MISC. DETAILS	
36	WINCH CAR/TRACK PLAN & DETAILS RAIL DETAILS	
37	HINGER RAIL PLAN & DETAILS	
38	HINGER RAIL DETAILS	
39	MISC. DETAILS	
40	MISC. DETAILS	
41	DOOR SCHEDULE, ELEVATIONS & MISC. DETAILS	
42	REMOVABLE RAIL DETAILS	
43	DESIGN CRITERIA, SCHEDULES & LEGEND	
44	FOOTING & FOUNDATION PLAN	
45	ROOF FRAMING PLAN	
46	HEAD WALL ELEVATION & PARTIAL REAR WALL ELEVATION	
47	SIDE WALL ELEVATION & MECHANICAL ROOM ELEVATIONS	
48	WALL SECTIONS	
49	LONGITUDINAL REINFORCING SECTIONS	
50	LONGITUDINAL REINFORCING SECTIONS	
51	TRANSVERSE REINFORCING SECTIONS	
52	BUILDING SECTIONS	
53	FOOTING & FOUNDATION DETAILS	
54	FOOTING & FOUNDATION DETAILS	
55	BLAST DOOR ELEVATION, PLAN & SECTION	
56	BLAST DOOR DETAILS	
57	RETAINING WALL ELEVATIONS & SECTION	

58 MECHANICAL FLOOR PLAN
 59 MECHANICAL ROOM FLOOR PLAN
 60 EXISTING STEAM LINE DEMOLITION PLAN
 61 NEW STEAM LINE LOCATION PLAN
 62 PIPING SCHEMATIC / EQUIPMENT LIST
 63 CONTROL SHEET SNOW MELTING SYSTEM
 64 CONTROL SHEET AIR HANDLING UNIT CONTROLS
 65 CONTROL SHEET BACK PANEL FOR HVAC SYSTEM
 66 INTERIOR DOOR LAYOUT FOR HVAC SYSTEM
 67 SNOW MELTING SYSTEM
 68 MECHANICAL DETAILS
 69 MECHANICAL DETAILS
 70 STEAM LINE PROFILES
 71 SYMBOL LIST, FIXTURE SCHEDULE & ABBREVIATIONS
 72 ELECTRICAL SITE PLAN
 73 SITE PLAN DETAILS
 74 SINGLE LINE DIAGRAM AND PANEL SCHEDULES
 75 POWER, LIGHTING & MISCELLANEOUS SYSTEMS
 76 GROUNDING & LIGHTING PROTECTION PLAN
 77 MISC. MIXED DETAILS
 78 ELECTRICAL TELEPHONE CABLE WIRING SCHEDULE AND AUXILIARY SYSTEM
 DETAILS

STANDARD DRAWINGS

(Attached to SPECIFICATION SECTION: GENERAL REQUIREMENTS)

Project Sign	150-52-1162
Sign Details	150-25-1232
Safety Sign	80-25-707
Hard Hat Sign	80-25-774

(Attached to SPECIFICATION SECTION: ELECTRICAL WORK, INTERIOR)

Dwg No. 40-06-04 Sheets 31, 44, 56, 60 & 65.

22. SAACONS 52.0236-4801 SALVAGE AND SCRAP GOVERNMENT PROPERTY (OCT 1993)

(a) "Government property" means all property owned by or leased to the Government or acquired by the Government under the terms of the contract. It includes both Government-furnished property and contractor-acquired property.

(b) "Salvage" means Government property in possession of a contractor, including subcontractors, that, because of its worn, damaged, deteriorated, or incomplete condition or specialized nature, has no reasonable prospect of sale or use as serviceable property without major repairs, but has some value in excess of its scrap value.

(c) "Scrap" means Government personal property that has no value except for its basic material content.

(d) In accordance with FAR 45.505-8 the Contractor shall maintain records of all scrap and salvage generated from this contract. The Contractor's records shall contain the following information:

- (1) Contract Number
- (2) Description of salvageable items or classification (material content) of scrap
- (3) Quantity on hand

(e) The Contractor shall provide final accounting and disposition recommendations of all Government property not consumed in performing this contract or delivered to the Government including salvage and scrap. The Government will review the Contractor's records and shall cause correction if the Government disagrees with the classification of items as salvage or scrap. The Contractor shall dispose of the items as directed by the Contracting Officer. Items designated as scrap (agreed to by the Contracting Officer) shall be retained by the Contractor; its disposition shall be the responsibility of the Contractor. See Specification Section 01500, paragraph entitled "Scrap Material". Items designated as salvageable items (agreed to by the Contracting Officer) shall be turned over to the Government.

23. SAACONS 52.0236-4581 AVAILABILITY OF UTILITIES SERVICES
(APR 1992)

All reasonably required amounts of water, electricity, and other utilities essential to contract performance will be made available to the contractor at no cost to the contractor from existing systems, outlets and supplies. All temporary connections, outlets and distribution lines, as may be required, shall be installed, maintained and removed by the Contractor at Contractor's expense; removal shall be before final acceptance of the work by the Government. The Contractor shall carefully conserve any utilities furnished without charge.

24. FAR 52.245-3 IDENTIFICATION OF GOVERNMENT-FURNISHED PROPERTY
(APR 1984)

(a) The Government will furnish to the Contractor the property identified in the Schedule to be incorporated or installed into the work or used in performing the contract. The listed property will be furnished f.o.b. railroad cars at the place specified in the contract Schedule or f.o.b. truck at the project site. The Contractor is required to accept delivery, pay any demurrage or detention charges, and unload and transport the property to the job site at its own expense. When the property is delivered, the Contractor shall verify its quantity and condition and acknowledge receipt in writing to the Contracting Officer. The Contractor shall also report in writing to the Contracting Officer within 24 hours of delivery any damage to or shortage of the property as received. All such property shall be installed or incorporated into the work at the expense of the Contractor, unless otherwise indicated in this contract.

(b) Each item of property to be furnished under this clause shall be identified in the Schedule by quantity, item, and description.
List of Government-Furnished Property:

<u>ITEM DESCRIPTION</u>	<u>VALUE OF ITEM</u>
SECURITY HASPS	\$460

END OF SECTION

ATTACHMENTS

ATTACHMENTS

1. GENERAL WAGE DECISION
2. DD FORM 2051, APPLICATION FOR COMMERCIAL AND GOVERNMENT ENTITY (CAGE) CODE - SEE SECTION 00100, DFARS 252.204-7001. COMPLETE SECTION B, BLOCKS 1 THROUGH 10, OF THE DD FORM 2051 AND RETURN WITH BID/COST PROPOSAL IF YOU DO NOT ALREADY HAVE A CAGE CODE.

IF YOU HAVE BEEN AWARDED A DOD CONTRACT WITHIN THE PAST SEVERAL YEARS, THE OFFICE THAT MADE THE AWARD WILL PROBABLY HAVE YOUR CAGE CODE NUMBER IN THEIR DATA BASE. (SACRAMENTO DISTRICT WILL NOT HAVE INFORMATION ON LOS ANGELES DISTRICT AWARDS AND VICE VERSA.) IF YOU DO NOT KNOW YOUR CAGE CODE NUMBER, SUBMIT THE DD FORM 2051 WITH YOUR BID/PROPOSAL. PLEASE DO NOT SEND THE DD FORM 2051 AHEAD OF TIME. BE SURE THAT YOU USE A STREET ADDRESS FOR YOUR FIRM, NOT A POST OFFICE BOX.

DO NOT UNDER ANY CIRCUMSTANCES DELAY SUBMITTING YOUR BID OR PROPOSAL WHILE ATTEMPTING TO OBTAIN A CAGE CODE NUMBER OR INFORMATION ON HOW TO COMPLETE THE DD FORM 2051. FAILURE TO FURNISH A CAGE CODE NUMBER OR THE FORM WILL NOT RENDER YOUR BID/PROPOSAL NONRESPONSIVE.

IN ORDER TO FILL IN THE STANDARD INDUSTRIAL CLASSIFICATION (SIC) NUMBER AS REQUIRED BY THE DD FORM 2051, YOU WILL FIND THE SIC CODE FOR THIS SOLICITATION IN SECTION 00600, FAR 52.219-1. TO LIST OTHER SIC CODES YOUR FIRM IS ALSO IN THE BUSINESS TO PROVIDE, THE STANDARD INDUSTRIAL CLASSIFICATION MANUAL IS SOLD BY THE NATIONAL TECHNICAL INFORMATION SERVICE, 5285 PORT ROYAL ROAD, SPRINGFIELD, VIRGINIA 22161. THE ORDER NUMBER IS PB 87-100012.

3. PREAWARD SURVEY - SEE SECTION 00100, SAACONS 52.0209-4501. THE PREAWARD SURVEY IS ATTACHED FOR INFORMATION PURPOSES ONLY; IT WILL BE REQUIRED ONLY FROM THE LOW BIDDER AFTER BID OPENING IF THE LOW BIDDER HAS NOT HAD A CONTRACT WITH THE SACRAMENTO DISTRICT, CORPS OF ENGINEERS, IN THE LAST TWELVE- MONTH PERIOD. IT IS NOT REQUIRED AS PART OF THE BID PACKAGE.
4. SAMPLE SUBCONTRACTING PLAN - SEE SECTION 00100, SAACONS 52.0219-4581; SECTION 00700, FAR 52.219-9; SECTION 00800, SAACONS 52.0219-4509. THE SAMPLE SUBCONTRACTING PLAN IS ATTACHED FOR INFORMATION PURPOSES ONLY. A SUBCONTRACTING PLAN WILL BE REQUIRED ONLY FROM THE LOW BIDDER IF THE LOW BIDDER IS A LARGE BUSINESS AND THE LOW BID IS OVER \$1 MILLION. A SUBCONTRACTING PLAN IS NOT REQUIRED FROM SMALL BUSINESSES. THE SUBCONTRACTING PLAN IS NOT REQUIRED FROM THE LOW BIDDER UNTIL AFTER THE BID OPENING; IT IS NOT REQUIRED AS PART OF THE BID PACKAGE.

GENERAL DECISION UT970034

UT34

Superseded General Decision No. UT960034

State: Utah

Construction Type:
BUILDING

County(ies):
WEBER

BUILDING CONSTRUCTION PROJECTS (does not include residential construction consisting of single family homes and apartments up to and including 4 stories)

Modification Number	Publication Date
0	02/14/1997
1	04/11/1997

COUNTY(ies):
WEBER

ASBE0069C 08/01/1995		
	Rates	Fringes
ASBESTOS WORKERS (Both the Insulation and Abatement involving Mechanical Surfaces)	19.64	6.30

SCOPE OF WORK:

Includes application of all insulating materials, protective coverings, coatings and finishings to all types of mechanical systems.

BOIL0182D 10/01/1994		
	Rates	Fringes
BOILERMAKERS	18.48	8.39

* CARP0722A 10/29/1995		
	Rates	Fringes
MILLWRIGHTS	19.83	3.25

ELEC0354I 06/01/1994		
	Rates	Fringes
ELECTRICIANS (Includes Low Voltage, Fiberoptic and Fire Alarm Installation)	18.14	3%+3.75

IRON0027F 07/01/1995		
	Rates	Fringes
IRONWORKERS	15.67	5.46

LABO0295F 10/01/1994		
	Rates	Fringes
LABORERS:		
Common	9.25	2.69

* PLUM0019D 01/01/1997		
	Rates	Fringes
PLUMBERS & PIPEFITTERS (including HVAC duct work)	19.38	5.18

SFUT0669A 01/01/1995		
	Rates	Fringes
SPRINKLER FITTERS	16.70	6.23

* SHEE0312F 01/01/1997		
	Rates	Fringes
SHEET METAL WORKERS (Including Architect/Roofing and HVAC		

Duct Work)	19.61	5.11

SUUT1006A 09/07/1994		
	Rates	Fringes
CARPENTERS (including drywall hanging)	12.68	2.85
CEMENT MASONS	12.95	2.50
POWER EQUIPMENT OPERATORS:		
Backhoe	10.00	
Crane	15.00	

WELDERS - Receive rate prescribed for craft performing operation
to which welding is incidental.

=====

Unlisted classifications needed for work not included within
the scope of the classifications listed may be added after
award only as provided in the labor standards contract clauses
(29 CFR 5.5(a)(1)(v)).

In the listing above, the "SU" designation means that rates
listed under that identifier do not reflect collectively
bargained wage and fringe benefit rates. Other designations
indicate unions whose rates have been determined to be
prevailing.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can
be:

- * an existing published wage determination
- * a survey underlying a wage determination
- * a Wage and Hour Division letter setting forth a
position on a wage determination matter
- * a conformance (additional classification and rate)
ruling

On survey related matters, initial contact, including requests
for summaries of surveys, should be with the Wage and Hour
Regional Office for the area in which the survey was conducted
because those Regional Offices have responsibility for the
Davis-Bacon survey program. If the response from this initial
contact is not satisfactory, then the process described in 2.)
and 3.) should be followed.

With regard to any other matter not yet ripe for the formal
process described here, initial contact should be with the Branch
of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U. S. Department of Labor
200 Constitution Avenue, N. W.
Washington, D. C. 20210

2.) If the answer to the question in 1.) is yes, then an
interested party (those affected by the action) can request

review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N. W.
Washington, D. C. 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U. S. Department of Labor
200 Constitution Avenue, N. W.
Washington, D. C. 20210

4.) All decisions by the Administrative Review Board are final.
END OF GENERAL DECISION

REQUEST FOR ASSIGNMENT OF A COMMERCIAL AND GOVERNMENT ENTITY (CAGE) CODE

(See Instructions on Reverse)

Form Approved
OMB No. 0704-0225
Expires May 31, 1990

SECTION A - TO BE COMPLETED BY INITIATOR

1. REQUESTING GOVERNMENT AGENCY / ACTIVITY

a. NAME Activity Code: 369		b. ADDRESS (Street, City, State and Zip Code) Corps of Engineers 1325 J Street, Rm 878 Sacramento, CA 95814-2922	
2. TYPE CODE REQUESTED (X one)		3. EXCEPTION CODES	
<input type="checkbox"/> a. TYPE A	<input type="checkbox"/> a. CAO		
<input checked="" type="checkbox"/> b. TYPE F	<input type="checkbox"/> b. ADP		

4. INITIATOR

a. TYPED NAME (Last, First, Middle Initial) MILLER, RONALD J.	b. OFFICE SYMBOL CESPK-CT	c. SIGNATURE 	d. TELEPHONE NO. (916) 557-5205
------------------------------------------------------------------	------------------------------	----------------------------------------------------------------------------------------------------	------------------------------------

SECTION B - TO BE COMPLETED BY FIRM TO BE CODED

1. FIRM

a. NAME (Include Branch of, Division of, etc.)	DO NOT USE A P.O. BOX ADDRESS!!!		
b. ADDRESS (Street, City, State and Zip Code)			
c. CAGE CODE (if previously assigned)			
2. IF FIRM PREVIOUSLY OPERATED UNDER OTHER NAME(S) OR OTHER ADDRESS(ES) SPECIFY THE PREVIOUS NAME(S) AND/OR ADDRESS(ES) (Use separate sheet of paper, if necessary)	3. PARENT COMPANY AND AFFILIATED FIRMS (X one, and complete as applicable)		
	<input type="checkbox"/> a. NONE		
	<input type="checkbox"/> b. CURRENTLY AFFILIATED WITH OTHER FIRMS (List name(s) and address(es) of such firms on a separate sheet of paper)		
	<input type="checkbox"/> c. PREVIOUSLY AFFILIATED WITH OTHER FIRMS (List name(s) and address(es) of such firms on a separate sheet of paper)		

4. PRIMARY BUSINESS CATEGORY (X one)

<input type="checkbox"/> a. MANUFACTURER	5. DISADVANTAGED SMALL BUSINESS STATUS (X one)	<input type="checkbox"/> a. APPROVED BY SMALL BUSINESS ADMINISTRATION (SBA) FOR SECTION 8(a) PROGRAM	6. NUMBER OF EMPLOYEES	
<input type="checkbox"/> b. DEALER/DISTRIBUTOR				
<input type="checkbox"/> c. CONSTRUCTION FIRM				
<input type="checkbox"/> d. SERVICE COMPANY				
<input type="checkbox"/> e. SALES OFFICE				
<input type="checkbox"/> f. OTHER (Specify)	<input type="checkbox"/> b. OTHER DISADVANTAGED SMALL BUSINESS FIRM	<input type="checkbox"/> c. NOT DISADVANTAGED SMALL BUSINESS FIRM	7. WOMAN OWNED BUSINESS (X one)	
			<input type="checkbox"/> a. YES	<input type="checkbox"/> b. NO
			8. STANDARD INDUSTRIAL CLASSIFICATION (SIC) CODE(S)	
			<input type="checkbox"/> a. PRIMARY	
			<input type="checkbox"/> b. OTHER (Specify)	

SOLICITATION NUMBER: DACA05-97-B-0082

CONTRACT SPECIALIST: LEVENSON-SNITZ

10. FIRM OFFICIAL

a. TYPED NAME (Last, First, Middle Initial)	b. DATE SIGNED (YYMMDD)	c. SIGNATURE	d. TELEPHONE NO.

INSTRUCTIONS FOR COMPLETING DD FORM 2051

GENERAL NOTE FOR PERSONNEL PREPARING OR PROCESSING THIS REPORT

Coding must be as indicated in the instructions. In cases where specific coding instructions are provided, reference must be made to the Department of Defense Manual for Standard Data Elements, DoD 5000.12-M. Noncompliance with either the coding instructions contained herein or those published in referenced manual will make the organization which fails to comply responsible for required concessions in data base communication.

SPECIFIC INSTRUCTIONS

SECTION A - TO BE COMPLETED BY THE INITIATING GOVERNMENT ACTIVITY	SECTION B - (Continued)
Item 1: Self-explanatory.	Item 4: Self-explanatory.
Item 2: Mark the type of code being requested. a. Type A - Manufacturers Code which is used in the Federal Catalog System to identify a certain facility at a specific location which is a possible source for the manufacture and/or design control of items cataloged by the Federal Government; or, b. Type F - Non-manufacturers Code which is required for identifying an organization/function in MILSCAP. These are assigned to contractors which are non-manufacturers or are manufacturers not qualifying for a Type A Code.	Item 5: A disadvantaged business firm is defined as a firm that is 51%, or more, owned, controlled, and operated by a person(s) who is socially and economically disadvantaged. "Controlled" is defined as exercising the power to make policy decisions. "Operated" is defined as actively involved in the day-to-day management of the firm. Item 6: Enter the number of employees. This number should include the employees of all affiliates. Item 7: A woman-owned business is defined as a firm that is 51%, or more, owned, controlled, and operated by a woman or women. "Controlled" and "Operated" are as defined in Item 5.
Item 3: If applicable, enter the exception DoD Activity Address Code for the Servicing Contract Administration Office (CAO) or ADP point.	Item 8: The SIC Code is a Government Index used to identify business activity and indicates the function (manufacturer, wholesaler, retailer, or service) and the line of business in which the company is engaged. If multiple SIC Codes, indicate the primary first, next important, etc.
Item 4: Self-explanatory.	
SECTION B - TO BE COMPLETED BY THE FIRM TO WHICH THE CODE WILL BE ASSIGNED	Items 9 and 10: Self-explanatory.
Items 1a and 1b: Self-explanatory.	NOTE: When any future changes are made to the coded facility; i.e., name change, location change, business sold or operations discontinued, etc., written notification stating the appropriate change should be sent to: <div style="text-align: right;"> Commander Defense Logistics Services Center ATTN: DLSC--SBB Federal Center 74 North Washington Battle Creek, MI 49017-3084 (616) 961-4358 FAX (616) 961-4265 </div>
Item 1c: If a CAGE Code (Type A or Type F) was previously assigned, enter it in this block.	
Item 2: Self-explanatory.	
Item 3: If a block other than "None" is marked, identify the Parent company by a (P) beside the firm name.	

PREAWARD SURVEY OF PROSPECTIVE CONTRACTORS
CONSTRUCTION CONTRACTS

It is the general policy of the Department of Defense that contracts shall be awarded only to contractors determined to be responsible in accordance with Part 9 of the Federal Acquisition Regulation (FAR).

No contract shall be awarded to any person or firm unless the Contracting Officer first makes an affirmative determination that the prospective contractor is responsible within the meaning of the FAR, Part 9.

Before making a determination of responsibility, the Contracting Officer shall have in his/her possession or obtain information sufficient to satisfy himself/herself that a prospective contractor currently meets the minimum FAR Part 9 standards.

In order to make the required determination and also to expedite the contract award, the following information must be submitted by the Contractor as directed (see Section 00100, SAACONS 52.0209-4501):

- A. COMPLETED CONTRACTOR EXPERIENCE DATA FORM WITH SUPPLEMENTAL SCHEDULES A-D (ATTACHED).
- B. LATEST FINANCIAL STATEMENTS. IF THE FINANCIAL STATEMENT IS MORE THAN 60 DAYS OLD, SUBMIT A CERTIFICATE STATING THAT THE FIRM'S FINANCIAL CONDITION IS SUBSTANTIALLY THE SAME, OR, IF NOT THE SAME, STATE THE CHANGES THAT HAVE TAKEN PLACE.
- C. PROVIDE LETTERS FROM BANKS OR OTHER FINANCIAL INSTITUTIONS WITH WHICH THE CONTRACTOR CONDUCTS BUSINESS. THE LETTERS SHOULD CONTAIN INFORMATION ABOUT YOUR FIRM'S ACCOUNTS, LOANS, LINES OF CREDIT, ETC., PROVIDING INFORMATION LEADING TO A DETERMINATION THAT YOUR FIRM IS "RESPONSIBLE" AS DEFINED IN THE FEDERAL ACQUISITION REGULATION, PART 9, "HAS THE FINANCIAL RESOURCES TO PERFORM THE CONTRACT OR THE ABILITY TO OBTAIN THEM". THE GOVT IS INTERESTED IN FINANCIAL STABILITY, TIMELY PAYMENTS, THE LENGTH AND NATURE OF THE RELATIONSHIP BETWEEN THE FIRM AND THE FINANCIAL INSTITUTION, ETC. WHICH REVEALS THE FIRM'S FINANCIAL ABILITY TO PERFORM THE CONTRACT. THE LETTERS SHOULD ALSO PROVIDE THE NAME AND TELEPHONE NUMBER OF THE BANK REPRESENTATIVE THE GOVERNMENT MAY CONTACT.

BE SURE TO INCLUDE IN YOUR PREAWARD SURVEY, INFORMATION ON ANY CONTRACTS YOU HAVE HAD WITH THE SACRAMENTO DISTRICT OR LOS ANGELES DISTRICT, CORPS OF ENGINEERS, WITHIN THE LAST 12 MONTHS.

THESE DOCUMENTS SHALL BE TREATED BY THE GOVERNMENT AS CONFIDENTIAL.

CONSTRUCTION CONTRACTOR EXPERIENCE DATA				DATE (Day, Month, Year)	
1. FIRM NAME			2. MAIN OFFICE ADDRESS (Street, City, State and Telephone)		
3. BRANCH OFFICES			4. SERVICES RENDERED <input type="checkbox"/> CONSTRUCTION <input type="checkbox"/> DESIGN <input type="checkbox"/> CONSULTANT		
5. ORGANIZATION <input type="checkbox"/> INDIVIDUAL <input type="checkbox"/> JOINT VENTURE <input type="checkbox"/> PARTNERSHIP <input type="checkbox"/> CORPORATION			6. DATE ORGANIZED		7. DATE INCORPORATED AND STATE
8. NAMES OF OFFICERS AND OTHER KEY PERSONNEL					
I - PRESENT PAYROLL PERSONNEL (List Number of Each Category Below)					
PARTNERS	OFFICERS	OTHER KEY	REMAINDER	TOTAL	SUBTOTAL PERMANENT MAXIMUM PERSONNEL AT ANY TIME
					DATE _____
II - EQUIPMENT OWNED			III - FINANCIAL DATA AS OF (Date) _____		
PRESENT VALUE (\$)		ACQUISITION COST (\$)		CURRENT ASSETS	CURRENT LIABILITIES
				NET WORTH	
IV - TOTAL CONTRACT VALUE OF CONSTRUCTION AND DEMOLITION IN PAST SIX YEARS EXCLUSIVE OF JOINT VENTURE				V - LARGEST JOB EVER CONTRACTED (If Other Than In Past Six Years)	
19	\$	LARGEST JOB IN PAST SIX YEARS		CONTRACT AMOUNT	DATE
19	\$	CONTRACT AMOUNT DATE DESCRIPTION		DESCRIPTION	
19	\$				
19	\$				
19	\$				
19	\$				
AVERAGE ANNUAL \$ INCOME		OWNER		OWNER	
VI - TYPE OF WORK IN WHICH FIRM SPECIALIZES					
VII - TYPE OF WORK AND ACCEPTABLE LOCATIONS FOR WHICH FIRM DESIRES TO BE CONSIDERED					
VIII - COST-REIMBURSEMENT TYPE CONTRACTS					
AGENCY OR OWNER		DATE		DESCRIPTION	
TYPED NAME AND POSITION OR TITLE OF PERSON SIGNING				SIGNATURE	
NOTE: Use reverse side for remarks, explanations, or detailed description of items reported above.					

SCHEDULE ACONSTRUCTION CONTRACTOR EXPERIENCE DATA

EXISTING COMMITMENTS: (List below the construction projects your firm has under way on this date, including those on which you are presently low bidder but have not received an award.)

CONTRACT NUMBER AND AMOUNT	DESCRIPTION OF WORK	FOR WHOM PERFORMED*	PERCENT COMPLETE	PERCENT SUBLET
-------------------------------	---------------------	---------------------	---------------------	-------------------

* PROVIDE NAME OF ORGANIZATION, POINT OF CONTACT AND TELEPHONE NUMBER FOR CONTACT.

SCHEDULE BCONSTRUCTION CONTRACTOR EXPERIENCE DATA

EXPERIENCE DATA: (List below the principal construction projects your firm has completed within the past six (6) years.)

<u>CONTRACT NO.</u>	<u>AMOUNT</u>	<u>DESCRIPTION/LOCATION</u>	<u>CONTACT PERSON/PHONE NO</u>	<u>PERCENT SUBLET</u>
---------------------	---------------	-----------------------------	--------------------------------	---------------------------

SCHEDULE CCONSTRUCTION CONTRACTOR EXPERIENCE DATA

CONSTRUCTION AND/OR TECHNICAL EQUIPMENT: (List total equipment and facilities owned for performing the work and present status as to whether or not it is committed to existing contracts.)

<u>QUANTITY</u>	<u>DESCRIPTION</u>	<u>CONDITION</u>	<u>YEARS OF SERVICE</u>	<u>PRESENT STATUS</u>
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SCHEDULE D

CONSTRUCTION CONTRACTOR EXPERIENCE DATA

TO BE COMPLETED IF PROPOSED MILITARY CONSTRUCTION CONTRACT EXCEEDS \$1,000,000.

A. Each contract awarded within the preceding three-month period exceeding \$1,000,000 in value with brief description of the contract:

B. Each contract awarded within the preceding three-year period not already physically completed and exceeding \$5,000,000 in value with brief description of the contract:

- S A M P L E -

SUBCONTRACTING PLAN

SUBCONTRACTING PLAN SUBMITTED IN ACCORDANCE WITH PUBLIC LAW 95-507 (THE FOLLOWING FORMAT IS ESTABLISHED IN ACCORDANCE WITH FAR 52.219-9(d)(1) THROUGH (d)(11) AND INCLUDES THE REQUIRED STATUTORY ELEMENTS AS DESCRIBED IN FAR 19.704. IT ALSO INCLUDES ADDITIONAL REQUIREMENTS OF THE DFARS 219.704 AND AFARS 219.704. EVALUATION OF THE SUBCONTRACTING PLAN BY THE GOVERNMENT WILL BE AS PRESCRIBED IN FAR (AND ITS SUPPLEMENTS) 19.705.

DO NOT JUST ADDRESS THE FOLLOWING ISSUES IN SHORT; FOLLOW THE GUIDANCE OF FAR 52.219-9 IN ITS ENTIRETY. FOR EXAMPLE, PARAGRAPH 11 BELOW ASKS FOR A DISCUSSION OF RECORDS; THE PLAN SHOULD ADDRESS ALL RECORDS AS DESCRIBED IN FAR 52.219-9(d)(11)(i) THROUGH (vi).

IN ACCORDANCE WITH FAR 19.704 IF THE CONTRACT CONTAINS OPTIONS, THE CUMULATIVE VALUE OF THE BASIC CONTRACT AND ALL OPTIONS IS CONSIDERED IN DETERMINING WHETHER A SUBCONTRACTING PLAN IS NECESSARY. ONCE IT HAS BEEN DECIDED IF A PLAN IS NECESSARY, THE SUBCONTRACTING PLAN SHALL CONTAIN SEPARATE PARTS, ONE FOR THE BASIC CONTRACT AND ONE FOR EACH OPTION. *IN OTHER WORDS, IT IS NECESSARY TO ADDRESS PLANNED SUBCONTRACTING DOLLARS AND PERCENTAGES OF TOTAL TO BE AWARDED TO SMALL; SMALL, DISADVANTAGED; WOMEN-OWNED SMALL; HBCU/MIs; AND QUALIFIED NONPROFIT AGENCIES FOR THE BLIND AND OTHER SEVERELY DISABLED SEPARATELY FOR THE BASIC CONTRACT PERIOD AND EACH OPTION YEAR. THEREFORE, PARAGRAPHS 1 AND 2 BELOW MUST BE PREPARED SEPARATELY FOR THE BASE YEAR AND EACH OPTION YEAR. ALL OTHER PARTS OF THE SUBCONTRACTING PLAN ONLY NEED TO BE ADDRESSED ONCE.*

IF THE SUBCONTRACTING PLAN'S PROPOSED SUBCONTRACTING GOALS DO NOT MEET THE CORPS OF ENGINEERS' MINIMUM SUBCONTRACTING GOALS, THE SUBCONTRACTING PLAN MUST BE SUBMITTED WITH A FULL EXPLANATION OF THE REASONS FOR THE LESSER GOALS ESTABLISHED BY THE PLAN. A SMALL DISADVANTAGED BUSINESS GOAL OF LESS THAN FIVE PERCENT MUST BE APPROVED TWO LEVELS ABOVE THE CONTRACTING OFFICER (DFARS 219.705-4).

PROJECT TITLE: _____

RFP/IFB NO.: _____ CONTRACT NO.: _____

CONTRACTOR NAME: _____

DIVISION: _____

INDIVIDUAL COMPLETING THIS PLAN: _____

TELEPHONE NO.: _____

1. Goals, expressed in terms of percentages of total planned subcontracting dollars, for the use of small business concerns; small, disadvantaged business concerns; women-owned small business concerns; historically black colleges and universities (HBCUs) and minority institutions (MIs); and qualified nonprofit agencies for the blind and other severely disabled as subcontractors. The offeror shall include all subcontracts that contribute to contract performance and may include a proportionate share of products and services that are normally allocated as indirect costs.

Percentage Goals:		Corps of Engineers Minimum Subcontracting Goals
Small Business	_____ %	55.0%
Small, Disadvantaged Business	_____ %	8.5%
Women-Owned Small Business	_____ %	3.0%
HBCUs and MIs	_____ %	
Qualified Nonprofit Agencies for the Blind and Other Severely Disabled	_____ %	

2. Statement of: (i) total dollars planned to be subcontracted, (ii) total dollars planned to be subcontracted to small business; (iii) total dollars planned to be subcontracted to small, disadvantaged business; (iv) total dollars planned to be subcontracted to women-owned small business; (v) total dollars planned to be subcontracted to HBCUs and MIs; and (vi) total dollars planned to be subcontracted to qualified nonprofit agencies for the blind and other severely disabled.

Total Cost of Prime Contract:	\$ _____	
Total Dollars to be Subcontracted	\$ _____	_____ % *
To Small Business	\$ _____	_____ % **
To Small, Disadvantaged Business	\$ _____	_____ % **
To Women-Owned Small Business	\$ _____	_____ % **
To HBCUs and MIs	\$ _____	_____ % **
To Qualified Nonprofit Agencies for the Blind and Other Severely Disabled	\$ _____	_____ % **

NOTES: * Calculate percentage of Total Dollars to be Subcontracted to Total Cost of Prime Contract

** Calculate subcontracted dollars to each group to Total Dollars to be Subcontracted, NOT TO Total Cost of Prime Contract.

PLANNED SUBCONTRACTING INCLUDES ALL PLANNED EXPENDITURES. TOTAL ESTIMATED COST TO SUBCONTRACTORS AND GOALS MUST BE ESTABLISHED EVEN IF THE CONTRACT IS OF THE INDEFINITE-DELIVERY TYPE.

SUBCONTRACTS AWARDED TO SMALL, DISADVANTAGED BUSINESSES; WOMEN-OWNED SMALL BUSINESSES; HBCU/MIs; AND QUALIFIED NONPROFIT AGENCIES FOR THE BLIND AND OTHER SEVERELY DISABLED COUNT TOWARD THE OVERALL SMALL BUSINESS GOAL. HBCU/MIs ARE COUNTED AS A SUBSET OF THE SMALL, DISADVANTAGED GOAL. THE CORPS OF ENGINEERS HAS NOT BEEN ASSIGNED A SET GOAL FOR HBCU/MIs OR QUALIFIED NONPROFIT AGENCIES FOR THE BLIND AND OTHER SEVERELY DISABLED.

IN ACCORDANCE WITH DFARS 219.703, QUALIFIED NONPROFIT AGENCIES FOR THE BLIND AND OTHER SEVERELY DISABLED THAT HAVE BEEN APPROVED BY THE COMMITTEE FOR PURCHASE FROM PEOPLE WHO ARE BLIND OR SEVERELY DISABLED UNDER THE JAVITS-WARNER-O'DAY (41 U.S.C. 46-48) ARE ELIGIBLE THROUGH SEPTEMBER 30, 1997, TO PARTICIPATE IN THE PROGRAM.

3. A description of the principal supply and service areas to be subcontracted and an identification of the types planned for subcontracting to (i) small business subcontractors, (ii) small, disadvantaged business subcontractors, (iii) women-owned small business subcontractors, (iv) HBCUs and MIs, (v) qualified nonprofit agencies for the blind and other severely disabled:

4. A statement of the method used in developing the proposed subcontracting goals for small business concerns; small, disadvantaged business concerns; women-owned small business concerns; HBCUs and MIs; and qualified nonprofit agencies for the blind and other severely disabled:

5. Description of the method used to identify potential sources for solicitation purposes to assure small; small, disadvantaged, women-owned small; HBCU and MI; and qualified nonprofit agencies for the blind and other severely disabled participation (e.g., existing company source lists, the Procurement Automated Source System (PASS) of the Small Business Administration, the National Minority Purchasing Council Vendor Information Service, the Research and Information Division of the Minority Business Development Agency in the Department of Commerce, or small; small, disadvantaged, women-owned small, HBCU or MI, or qualified nonprofit agencies for the blind and other severely disabled concerns trade associations):

6. A statement as to whether or not the offeror included indirect costs in establishing the subcontracting goals, and if so, a description of the method used to determine the proportionate share of indirect costs to be incurred with: (i) small business concerns; (ii) small, disadvantaged business concerns; (iii) women-owned small business concerns; (iv) HBCUs and MIs); and (v) qualified nonprofit agencies for the blind and other severely disabled:

7. The name of the individual employed by the offeror who will administer the offeror's subcontracting program and a description of the duties of the individual.

Name: _____

Title and Telephone Number: _____

Address: _____

City, State and Zip Code: _____

Duties (Attachment may be used):

8. Describe the efforts the offeror will make to assure that small business concerns; small, disadvantaged business concerns; women-owned small business concerns; HBCUs and MIs; and qualified nonprofit agencies for the blind and other severely disabled will have an equitable opportunity to compete for subcontractors under this contract:

9. I do herewith assure that this concern will include the clause at FAR 52.219-8 entitled "Utilization of Small, Small Disadvantaged and Women-Owned Small Business Concerns" in all subcontracts which offer further subcontracting opportunities and will require all subcontractors (except small business concerns) who receive subcontracts in excess of \$500,000 (or, in the case of a contract for construction of any public facility, \$1 million) to adopt a plan similar to the plan agreed to by this concern and in consonance with the FAR clause 52.219-9.

10. I also assure that this concern will (i) cooperate in any studies or surveys as may be required, (ii) submit periodic reports in order to allow the Government to determine the extent of compliance by the offeror with the subcontracting plan, and (iii) submit Standard Form (SF) 294, Subcontracting Report for Individual Contracts, and SF 295, Summary Subcontract Report, in accordance with the instructions of the forms, and (iv) ensure that the subcontractors under this contract agree to submit the required SF 294s and 295s. I assure that this concern will submit an SF 295 on Corps of Engineers projects only. The SF 295 shall be completed and distributed in accordance with the Corps of Engineers supplemental instructions. I will not report Corps of Engineers projects through any other agency unless authorized by the Contracting Officer.

11. Provide a recitation of the types of records the offeror will maintain to demonstrate procedures which have been adopted to comply with the requirements and goals set forth in the plan, including the establishment of source lists; and a description of its efforts to locate small business concerns; small, disadvantaged business concerns; women-owned small business concerns; HBCUs and MIs; and qualified nonprofit agencies for the blind and other severely disabled and award subcontracts to them. The records shall include at least the following (on a plant-wide or company-wide basis, unless otherwise indicated):

a. Source lists (e.g., PASS), guides, and other data that identify small business concerns; small, disadvantaged business concerns; women-owned small business concerns; HBCUs and MIs; and qualified nonprofit agencies for the blind and other severely disabled.

b. Organizations contacted in an attempt to locate sources that are small; small disadvantaged; women-owned small business concerns, HBCUs and

MIs; and qualified nonprofit agencies for the blind and other severely disabled.

c. Records on each subcontract solicitation resulting in an award of more than \$100,000, indicating (A) whether small business concerns were solicited and if not, why not, (B) whether small disadvantaged business concerns were solicited and if not, why not, (C) whether women-owned small business concerns were solicited and if not, why not, (D) whether HBCUs and MIs were solicited and if not, why not, (E) whether qualified nonprofit agencies for the blind and other severely disabled were solicited and if not, why not, and (F) if applicable, the reason award was not made to a small business concern.

d. Records of any outreach efforts to contact (A) trade associations, (B) business development organizations, and (C) conferences and trade fairs to locate small; small disadvantaged; women-owned small business sources; HBCUs and MIs; and qualified nonprofit agencies for the blind and other severely disabled.

e. Records of internal guidance and encouragement provided to buyers through (A) workshops, seminars, training, etc., and (B) monitoring performance to evaluate compliance with the programs's requirements.

f. On a contract-by-contract basis, records to support award data submitted by the offeror to the Government, including the name, address, and business size of each subcontractor. Contractors having company or division-wide annual plans need not comply with this requirement.

12. Discuss the extent to which the offeror has historically been successful in complying with the requirements of the clauses at FAR 52.219-8, Utilization of Small, Small Disadvantaged and Women-Owned Small Business Concerns, and 52.219-9, Small, Small Disadvantaged and Women-Owned Small Business Subcontracting Plan, in establishing realistic yet challenging goals and show evidence of ability to achieve the goals. Information addressing past performance on DoD contracts evidencing achievement of established subcontracting goals will be in the form of Standard Forms 294 and 295 (attach these to this plan). Offerors who have had no prior Department of Defense contracts from which to assess past performance will not be penalized. Those who have had prior DoD contracts must provide the SF 294s and 295s on past DoD contracts.

(Signature)

(Title of Corporate Officer)

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001 COVER SHEET
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 003 DD FORM 1707

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00100	INSTRUCTIONS, CONDITIONS AND NOTICES TO BIDDERS/ OFFERORS AND EVALUATION CRITERIA FOR AWARD
00600	REPRESENTATIONS, CERTIFICATIONS AND OTHER STATEMENTS OF BIDDERS/OFFERORS
00700	CONTRACT CLAUSES
00800	SPECIAL CONTRACT REQUIREMENTS

ATTACHMENTS :ATCH NO.

0901	GENERAL WAGE DECISION (ATTACHMENT 1)
0902	DD FORM 2051 (ATTACHMENT 2)
0903	PREAWARD SURVEY (ATTACHMENT 3)
0904	SUBCONTRACTING PLAN (ATTACHMENT 4)
010	TECHNICAL SPECIFICATIONS (SEE TECHNICAL SPECIFICATIONS' TABLE OF CONTENTS FOR SPECIFICATION SECTIONS INCLUDED IN THIS SOLICITATION/CONTRACT) DRAWINGS (SEPARATE PACKAGE) (LIST OF DRAWINGS-SECTION 00800)

NOTE:

AS A MINIMUM ANY CONTRACT AWARDED AS A RESULT OF THIS
SOLICITATION SHALL CONSIST OF THE FOLLOWING DOCUMENTS:

STANDARD FORM 1442, SECTIONS 00010, 00700, 00800, TECHNICAL
SPECIFICATIONS AND DRAWINGS, AND ATTACHMENTS AS DESCRIBED IN
CONTRACT DOCUMENT.

SECTION 00600, AS COMPLETED BY AWARDEE, IS INCORPORATED INTO
ANY RESULTANT CONTRACT BY REFERENCE.

SECTION 00100 IS INCLUDED FOR SOLICITATION PURPOSES ONLY. THIS
SECTION WILL BE REMOVED, MAINTAINED IN THE CONTRACT FILE AND
NOT MADE PART OF THE CONTRACT.

AMENDMENTS ARE INCORPORATED INTO THE RESULTANT CONTRACT.

SUBCONTRACTING PLAN (IF REQUIRED) BECOMES AN ATTACHMENT TO AND A
MATERIAL PART OF THE CONTRACT.

INFORMATION TO OFFERORS OR BIDDERS**COVER SHEET****1. SOLICITATION NUMBER**DACA05-97-B-0082
Spec. No. 9777**2. (X one)**

x

a. SEALED BID**b. NEGOTIATED (RFP)****c. NEGOTIATED (RFQ)****INSTRUCTIONS**

NOTE THE AFFIRMATIVE ACTION REQUIREMENT OF THE EQUAL OPPORTUNITY CLAUSE WHICH MAY APPLY TO THE CONTRACT RESULTING FROM THIS SOLICITATION.

You are cautioned to note the "Certification of Non-Segregated Facilities" in the solicitation. Failure to agree to the certification will render your reply nonresponsive to the terms of solicitations involving awards of contracts exceeding \$25,000 which are not exempt from the provisions of the Equal Opportunity clause.

"Fill-ins" are provided on the face and reverse of Standard Form 1442 or other solicitation documents and Sections of Table of Contents in this solicitation and should be examined for applicability.

See the provision of this solicitation entitled either "Late Bids, Modifications of Bids or Withdrawal of Bids" or "Late Proposals, Modifications of Proposals and Withdrawals of Proposals."

When submitting your reply, the envelope used must be plainly marked with the Solicitation Number, as shown above, and the date and local time set forth for bid opening or receipt of proposals in the solicitation document.

If NO RESPONSE is to be submitted, detach this sheet from the solicitation, complete the information requested on reverse, fold, affix postage, and mail. NO ENVELOPE IS NECESSARY.

Replies must set forth full, accurate, and complete information as required by this solicitation (including attachments). The penalty for making false statements is prescribed in 18 U.S.C. 1001.

3. ISSUING OFFICE (Complete mailing address, including Zip Code)

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
ATTN: CONTRACTING DIVISION, PLAN ROOM
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

4. ITEMS TO BE PURCHASED (Brief description)

SEE SF-1442, BLOCK 10.

TYPE OF CONTRACT: SEE SECTION 00100, FAR CLAUSE 52.216-1

5. PROCUREMENT INFORMATION (X and complete as applicable)

x

a. THIS PROCUREMENT IS UNRESTRICTED**b. THIS PROCUREMENT IS A 100 % SET-ASIDE FOR ONE OF THE FOLLOWING (X one).**
(See Section 00700)**(3) Combined Small Business/Labor Area Concerns****(1) Small Business [8(a)]****(2) Labor Surplus Area Concerns****(4) Small Disadvantaged Business Concerns****6. ADDITIONAL INFORMATION**

COMPLETE DETAILS FOR PROPER SUBMISSION OF BIDS ARE FOUND IN SECTIONS 00100, 00600 AND ATTACHMENTS. REMINDER: ACKNOWLEDGE ALL AMENDMENTS (FILL IN BACK PAGE OF SF-1442 OR RETURN SIGNED COPY OF SF-30). IF ANY OF THE AMENDMENTS FURNISHED AMENDED PAGES WHICH ARE PART OF THE BID, THE AMENDED PAGES MUST BE USED IN THE BID.

BID WILL INCLUDE:

- A. COMPLETED AND SIGNED SF-1442 (SECTION 00010)
- B. COMPLETED PRICING SCHEDULE (SECTION 00010)
- C. COMPLETED REPRESENTATIONS/CERTIFICATIONS (SECTION 00600)
- D. DD FORM 2051, CAGE CODE (SEE SECTION 00100, DFARS 252.204-7001, AND ATTACHMENTS). COMPLETE AND SUBMIT IF YOU DO NOT HAVE A CAGE CODE)
- E. BID GUARANTEE
- F. ACKNOWLEDGEMENT OF AMENDMENTS, IF ANY AMENDMENTS WERE ISSUED
- G. ANY OTHER DOCUMENTS REQUIRED BY THE SOLICITATION (SEE ATTACHMENTS SECTION)

7. POINT OF CONTACT FOR INFORMATION**a. NAME (Last, First, Middle Initial)**

SEE SECTION 00100

b. ADDRESS (Include Zip Code)**c. TELEPHONE NUMBER (Include Area Code and Extension) (NO COLLECT CALLS)**

SEE SECTION 00100

SAME AS BLOCK 3 ABOVE

8. REASONS FOR NO RESPONSE <i>(X all that apply)</i>			
a. CANNOT COMPLY WITH SPECIFICATIONS		b. CANNOT MEET DELIVERY REQUIREMENT	
c. UNABLE TO IDENTIFY THE ITEM(S)		d. DO NOT REGULARLY MANUFACTURE OR SELL THE TYPE OF ITEMS INVOLVED	
e. OTHER <i>(Specify)</i>			
9. MAILING LIST INFORMATION <i>(X one)</i>			
YES	NO	WE DESIRE TO BE RETAINED ON THE MAILING LIST FOR FUTURE PROCUREMENT OF THE TYPE OF ITEM(S) INVOLVED.	
10. RESPONDING FIRM			
a. COMPANY NAME		b. ADDRESS <i>(Include Zip Code)</i>	
c. ACTION OFFICER			
(1) Typed or Printed Name <i>(Last, First, Middle Initial)</i>	(2) Title	(3) Signature	(4) Date Signed <i>(YYMMDD)</i>

DD Form 1707 Reverse, MAR 89

FOLD

FOLD

FOLD

FOLD

FROM

AFFIX
STAMP
HERE

SOLICITATION NUMBER	
DATE <i>(YYMMDD)</i>	LOCAL TIME

TO

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
ATTN: CONTRACTING DIVISION, PLAN ROOM
1325 J STREET
SACRAMENTO, CA 95814-2922

SECTION 00010

SOLICITATION, OFFER AND AWARD (STANDARD FORM 1442)
AND PRICING SCHEDULE

SOLICITATION, OFFER, AND AWARD <i>(Construction, Alteration, or Repair)</i>	1. SOLICITATION NO. DACA05-97-B-0082	2. TYPE OF SOLICITATION <input checked="" type="checkbox"/> SEALED BID (IFB) <input type="checkbox"/> NEGOTIATED (RFP)	3. DATE ISSUED 97 OCT 09	PAGE OF PAGES 1
	IMPORTANT - The "offer" section on the reverse must be fully completed by offeror.			
4. CONTRACT NO.	5. REQUISITION/PURCHASE REQUEST NO.	6. PROJECT NO.		
7. ISSUED BY CODE	8. ADDRESS OFFER TO			
DEPARTMENT OF THE ARMY U.S. ARMY ENGINEER DISTRICT, SACRAMENTO CORPS OF ENGINEERS 1325 J STREET SACRAMENTO, CALIFORNIA 95814-2922		DEPARTMENT OF THE ARMY U.S. ARMY ENGINEER DISTRICT, SACRAMENTO UTAH AREA OFFICE 7227 6TH STREET, BUILDING 366 HILL AIR FORCE BASE, UTAH 84056-5214		
9. FOR INFORMATION CALL: 	A. NAME See SECTION 00100	B. TELEPHONE NO. (Include area code) (NO COLLECT CALLS) See SECTION 00100		

SOLICITATION

NOTE: In sealed bid solicitations, "offer" and "offeror" mean "bid" and "bidder".

10. THE GOVERNMENT REQUIRES PERFORMANCE OF THE WORK DESCRIBED IN THESE DOCUMENTS (Title, identifying no., date):

PEACEKEEPER STORAGE FACILITY
HILL AIR FORCE BASE, UTAH

Specification No. 9777

Description: PROVIDE TWO NEW FOUR-BAY PROPELLANT STORAGE MAGAZINES. THIS INCLUDES EXCAVATION FOR EARTH COVERED, CONCRETE REINFORCED STRUCTURES. STORAGE MAGAZINES WILL HAVE; TRAIN RAIL ACCESS, LOADING/RECEIVING DOCKS, ACCESS ROADS, SECURITY FENCING/MONITORING SYSTEMS AND NECESSARY SUPPORT (UTILITY CONNECTIONS, FIRE PROTECTION, ALARMS, ETC.).

Estimated Cost Range of Project: \$5,000,000 - 10,000,000

Any Contract awarded under this solicitation will be made pursuant to Public Law 100-656, Small Business Competitiveness Demonstration Program. See DD Form 1707, Block 5 for unrestricted/set-aside information.

11. The Contractor shall begin performance within <u>10</u> calendar days and complete it within <u>540</u> calendar days after receiving <input type="checkbox"/> award, <input checked="" type="checkbox"/> notice to proceed. This performance period is <input checked="" type="checkbox"/> mandatory, <input type="checkbox"/> negotiable (See <u>SECTION 00800, FAR 52.211-10</u> .)	
12A. THE CONTRACTOR MUST FURNISH ANY REQUIRED PERFORMANCE AND PAYMENT BONDS? (If "YES," indicate within how many calendar days after award in Item 12B.) <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	12B. CALENDAR DAYS Ten (10)
13. ADDITIONAL SOLICITATION REQUIREMENTS:	
A. Sealed offers in original and <u>0</u> copies to perform the work required are due at the place specified in Item 8 by <u>2:00 PM</u> (hour) local time, <u>97 NOV 13</u> (date). If this is a sealed bid solicitation, offers will be publicly opened at that time. Sealed envelopes containing offers shall be marked to show the offeror's name and address, the solicitation number, and the date and time offers are due.	
B. An offer guarantee <input checked="" type="checkbox"/> is, <input type="checkbox"/> is not required.	
C. All offers are subject to the (1) work requirements, and (2) other provisions and clauses incorporated in the solicitation in full text or by reference.	
D. Offers providing less than <u>60</u> calendar days for Government acceptance after the date offers are due will not be considered and will be rejected.	

OFFER (Must be fully completed by offeror)

14. NAME AND ADDRESS OF OFFEROR (Include ZIP Code)

15. TELEPHONE NO. (Include area code)

() FAX ()

16. REMITTANCE ADDRESS (Include only if different than Item 14)

CEC: _____ CAGE CODE: _____

CODE

FACILITY CODE

17. The offeror agrees to perform the work required at the prices specified below in strict accordance with the terms of this solicitation, if this offer is accepted by the Government in writing within _____ calendar days after the date offers are due. (Insert any number equal to or greater than the minimum requirement stated in Item 13D. Failure to insert any number means the offeror accepts the minimum in Item 13D.)

AMOUNTS

See Pricing Schedule

18. The offeror agrees to furnish any required performance and payment bonds.

19. ACKNOWLEDGEMENT OF AMENDMENTS

(The offeror acknowledges receipt of amendments to the solicitation - give number and date of each)

AMENDMENT NO.										
DATE										

20A. NAME AND TITLE OF PERSON AUTHORIZED TO SIGN OFFER
(Type or print)

20B. SIGNATURE

20C. OFFER DATE

AWARD (To be completed by Government)

See pg. 3 for 20D

21. ITEMS ACCEPTED:

22. AMOUNT

23. ACCOUNTING AND APPROPRIATION DATA

24. SUBMIT INVOICES TO ADDRESS SHOWN IN
(4 copies unless otherwise specified)

ITEM

25. OTHER THAN FULL AND OPEN COMPETITION PURSUANT TO

☐ 10 U.S.C. 2304(c) () ☐ 41 U.S.C. 253(c) ()

26. ADMINISTERED BY

CODE

27. PAYMENT WILL BE MADE BY

CONTRACTING OFFICER WILL COMPLETE ITEM 28 OR 29 AS APPLICABLE

☐ 28. NEGOTIATED AGREEMENT (Contractor is required to sign this document and return _____ copies to issuing office.) Contractor agrees to furnish and deliver all items or perform all work requirements identified on this form and any continuation sheets for the consideration stated in this contract. The rights and obligations of the parties to this contract shall be governed by (a) this contract award, (b) the solicitation, and (c) the clauses, representations, certifications, and specifications incorporated by reference in or attached to this contract.

☐ 29. AWARD (Contractor is not required to sign this document.) Your offer on this solicitation is hereby accepted as to the items listed. This award consummates the contract, which consists of (a) the Government solicitation and your offer, and (b) this contract award. No further contractual document is necessary.

30A. NAME AND TITLE OF CONTRACTOR OR PERSON AUTHORIZED TO SIGN
(Type or Print)

31A. NAME OF CONTRACTING OFFICER (Type or Print)

30B. SIGNATURE

30C. DATE

31B. UNITED STATES OF AMERICA

31C. AWARD DATE

BY

BLOCK 20D:

(1) IF THE OFFEROR IS A JOINT VENTURE, EACH PARTICIPANT IN THE JOINT VENTURE MUST COMPLETE THE FOLLOWING:

_____ Company Name	_____ Signature	_____ Title
_____ Company Name	_____ Signature	_____ Title
_____ Company Name	_____ Signature	_____ Title

NOTE: If a corporation is participating as a member of a Joint Venture, the certificate below must also be completed and signed.

CORPORATION AUTHORIZATION TO PARTICIPATE IN JOINT VENTURE CERTIFICATE

I, _____, certify that I am the Secretary of the corporation
(name)
named as a participant in a Joint Venture on this offer; that
_____, who signed said offer on behalf of the corporation, was
(name)
then _____ of said corporation; that the signature thereto is
(title)
genuine; that said contract was duly signed, sealed and attested for and in
behalf of said corporation by authority of its governing body; and that the
corporation is authorized to participate in the Joint Venture on this offer.

(Name of Corporation)

(Secretary)

(2) IF THE OFFEROR IS A PARTNERSHIP, LIST FULL NAME OF ALL PARTNERS BELOW. SIGNATURES BY ALL PARTNERS HERE SIGNIFY THAT THE INDIVIDUAL WHO SIGNED THE OFFER IN BLOCK 20B HAS THE AUTHORITY TO BIND THE PARTNERSHIP.

_____ Name	_____ Signature
_____ Name	_____ Signature
_____ Name	_____ Signature

(3) IF THE OFFEROR IS A CORPORATION, THE OFFER SHALL BE SIGNED IN THE CORPORATE NAME FOLLOWED BY THE WORD "BY" AND THE SIGNATURE OF THE PERSON AUTHORIZED TO SIGN THE OFFER IN BLOCK 20B. PROVIDE PROOF THAT THE PERSON SIGNING FOR THE CORPORATION HAS THE AUTHORITY TO BIND THE CORPORATION BY COMPLETING THE FOLLOWING CERTIFICATE:

CORPORATION AUTHORIZATION CERTIFICATE

I, _____, certify that I am the Secretary of the
(name)
corporation named as offeror in the within offer; that _____,
(name)
who signed said offer on behalf of the corporation, was then

_____ of said corporation, that the signature
(title)
thereto is genuine; that said contract was duly signed, sealed and attested
for in behalf of said corporation by authority of its governing body.

(Name of Corporation)

(Secretary)

(4) IF THE OFFEROR IS AN INDIVIDUAL DOING BUSINESS AS A FIRM, THE OFFER SHALL
BE SIGNED BY THAT INDIVIDUAL IN BLOCK 20B FOLLOWED BY THE WORDS "AN INDIVIDUAL
DOING BUSINESS AS _____ (INSERT NAME OF FIRM).

(5) WHEN AN AGENT SIGNS THE OFFER, PROVIDE PROOF OF THE AGENT'S AUTHORITY TO
BIND THE PRINCIPAL.

PRICING SCHEDULE

CONTRACTOR SHALL FURNISH ALL PLANT, LABOR, MATERIAL, EQUIPMENT, ETC. NECESSARY TO PERFORM ALL WORK IN STRICT ACCORDANCE WITH THE TERMS AND CONDITIONS SET FORTH IN THE CONTRACT TO INCLUDE ALL ATTACHMENTS THERETO.

ITEM NO.	DESCRIPTION	AMOUNT
0001	PEACEKEEPER STORAGE FACILITY, COMPLETE TO THE 5-FOOT BUILDING LINE	\$ _____
0002	SITE WORK AND UTILITIES OUTSIDE THE 5-FOOT BUILDING LINE	\$ _____
TOTAL PRICE		\$ _____

1. Prices must be submitted on all individual items of this Pricing Schedule. Failure to do so may be cause for rejection of bids.

2. If a modification to a price is submitted which provides for a lump sum adjustment to the total price, the application of the lump sum adjustment to each item in the Pricing Schedule must be stated. If it is not stated, the bidder/offeror agrees that the lump sum adjustment shall be applied on a pro rata basis to every item in the Pricing Schedule.

3. EFARS 52.214-5000 APPARENT CLERICAL MISTAKES - ARITHMETIC DISCREPANCIES
(DEC 1995)--EFARS

(a) For the purpose of initial evaluation of bids/offers, the following will be utilized in resolving arithmetic discrepancies found on the face of the Pricing Schedule as submitted by bidders/offerors:

- (1) Obviously misplaced decimal points will be corrected;
- (2) Discrepancy between unit price and extended price, the unit price will govern;
- (3) Apparent errors in extension of unit prices will be corrected;
- (4) Apparent errors in addition of lump-sum and extended prices will be corrected.

(b) For the purpose of bid/offer evaluation, the Government will proceed on the assumption that the bidder/offeror intends the bid/offer to be evaluated on basis of the unit prices, the total arrived at by resolution of arithmetic discrepancies as provided above and the bid/offer will be so reflected on the abstract of bids/offers.

(c) These correction procedures shall not be used to resolve any ambiguity concerning which bid is low.

SECTION 00100

INSTRUCTIONS, CONDITIONS AND NOTICES TO BIDDERS/OFFERORS
AND EVALUATION CRITERIA FOR AWARD

SECTION 00100

INSTRUCTIONS, CONDITIONS AND NOTICES TO BIDDERS/OFFERORS
AND EVALUATION CRITERIA FOR AWARD

1. FAR 52.252-1 SOLICITATION PROVISIONS INCORPORATED BY
REFERENCE (JUN 1988)

This solicitation incorporates one or more solicitation provisions by reference, with the same force and effect as if they were given in full text. Upon request, the Contracting Officer will make their full text available.

SOLICITATION PROVISIONS BY REFERENCE:

INSTRUCTIONS, CONDITIONS AND NOTICES TO BIDDERS/OFFERORS:

2. DFARS 252-204-7001 COMMERCIAL AND GOVERNMENT ENTITY (CAGE) CODE
REPORTING (DEC 1991)
3. DFARS 252.211-7003 BRAND NAME OR EQUAL (DEC 1991)
(APPLICABLE IF SPECS CALL OUT A BRAND NAME)
4. FAR 52.214-1 SOLICITATION DEFINITIONS--SEALED BIDDING
(JUL 1987)
5. FAR 52.214-3 AMENDMENTS TO INVITATIONS FOR BIDS
(DEC 1989)
6. FAR 52.214-4 FALSE STATEMENTS IN BIDS (APR 1984)
7. FAR 52.214-5 SUBMISSION OF BIDS (MAR 1997)
8. FAR 52.214-6 EXPLANATION TO PROSPECTIVE BIDDERS
(APR 1984)
9. FAR 52.214-7 LATE SUBMISSIONS, MODIFICATIONS, AND WITHDRAWALS
OF BIDS (MAY 1997)
10. FAR 52.214-18 PREPARATION OF BIDS--CONSTRUCTION
(APR 1984)
11. FAR 52.214-19 CONTRACT AWARD--SEALED BIDDING--CONSTRUCTION
(AUG 1996)
12. FAR 52.214-34 SUBMISSION OF OFFERS IN THE ENGLISH LANGUAGE
(APR 1991)
(APPLICABLE IF DFARS 252.225-7007 OR 252.225-
7036 OR FAR 52.225-15 ARE APPLICABLE - SEE
SECTION 00700)
13. FAR 52.214-35 SUBMISSION OF OFFERS IN U.S. CURRENCY
(APR 1991)
(APPLICABLE IF DFARS 252.225-7007 OR 252.225-
7036 OR FAR 52.225-15 ARE APPLICABLE - SEE
SECTION 00700)

EVALUATION CRITERIA FOR AWARD:

THE FOLLOWING SOLICITATION PROVISIONS ARE INCLUDED IN FULL TEXT

INSTRUCTIONS, CONDITIONS AND NOTICES TO BIDDERS/OFFERORS:

14. SAACONS 52.0214-4581 INQUIRIES (APR 1992)
15. SAACONS 52.0214-4582 DIRECTIONS FOR SUBMITTING BIDS/PROPOSALS (APR 1992)
16. FAR 52.236-27 SITE VISIT (CONSTRUCTION) (FEB 1995), ALTERNATE I (FEB 1995)
17. SAACONS 52.0209-4501 CONTRACTOR RESPONSIBILITY, PREAWARD SURVEY (JUL 1995)
18. FAR 52.211-14 NOTICE OF PRIORITY RATING FOR NATIONAL DEFENSE USE (SEP 1990)
19. DFARS 252.211-7002 AVAILABILITY FOR EXAMINATION OF SPECIFICATIONS, STANDARDS, PLANS, DRAWINGS, DATA ITEM DESCRIPTIONS, AND OTHER PERTINENT DOCUMENTS (DEC 1991)
20. SAACONS 52.0211-4805 AVAILABILITY OF SPECIFICATIONS, STANDARDS AND DESCRIPTIONS (OCT 1992)
21. SAACONS 52.0214-4583 TELEGRAPHIC BIDS/OFFERS (APR 1992)
22. SAACONS 52.0214-4584 FACSIMILE BIDS/OFFERS (APR 1992)
23. FAR 52.216-1 TYPE OF CONTRACT (APR 1984)
24. SAACONS 52.0219-4581 PREPARATION OF SUBCONTRACTING PLAN (APR 1994)
25. FAR 52.222-23 NOTICE OF REQUIREMENT FOR AFFIRMATIVE ACTION TO ENSURE EQUAL EMPLOYMENT OPPORTUNITY (APR 1984)
26. SAACONS 52.0228-4504 PERFORMANCE AND PAYMENT BONDS (AUG 1991)
27. SAACONS 52.0228-4506 INDIVIDUAL SURETIES IN SUPPORT OF BID BONDS (AUG 1991)
28. SAACONS 52.228-4507 BID GUARANTEE FORM AND AMOUNT (JAN 1993)
29. DFARS 252.228-7004 BONDS OR OTHER SECURITY (DEC 1991)
30. FAR 52.233-2 SERVICE OF PROTEST (AUG 1996)
31. SAACONS 52.0236-4507 ACCEPTANCE OF OFFERS (AUG 1991)
32. FAR 52.252-3 ALTERATIONS IN SOLICITATION (APR 1984)
33. FAR 52.252-5 AUTHORIZED DEVIATIONS IN PROVISIONS (APR 1984)

EVALUATION CRITERIA FOR AWARD:

34. SAACONS 52.0214-4503 EVALUATION FOR AWARD (JAN 1991)

FULL TEXT SOLICITATION PROVISIONS:

INSTRUCTIONS, CONDITIONS AND NOTICES TO BIDDERS/OFFERORS:

14. SAACONS 52.0214-4581 INQUIRIES (APR 1992)

Perspective bidders/offerors should submit inquiries related to this solicitation by writing or calling the following (collect calls will not be accepted):

(1) For information related to amendments and information on bid opening dates or dates set for receipt of proposals:

Plan Room Fax (916) 557-7842

(2) For inquiries of a contractual nature (solicitation requirements, interpretation of contractual language) call:

Ms. Levenson-Snitz, Contract Specialist (916) 557-7945
or fax questions to (916) 557-7854.

For bid results only call (916) 557-5237. This phone line is dedicated to Government-recorded bid results; it is an unattended number and messages left may not be answered. If this number has no bid information, call the Contract Specialist above.

(3) All **technical** questions on the specifications or drawings will be submitted in writing (or faxed) to:

Department of the Army
U.S. Army Engineer District, Sacramento
Corps of Engineers
ATTN: Contracting Division
1325 J Street
Sacramento CA 95814-2922
FAX: (916) 557-7854

(4) Please include the solicitation number, project title and location of project with your questions. Written inquiries must be received by this office not later than 14 calendar days prior to bid opening date/date set for receipt of offers.

(5) For prospective bidders with electronic mail capabilities, questions of a contractual or technical nature can be sent to llevenson@usace.mil. Please include the full name of your company, as well as telephone and fax numbers, in your correspondence.

(6) Oral explanations or instructions are not binding. Any information given to a bidder/offeror which impacts the bid/offer will be given in the form of a written amendment to the solicitation.

15. SAACONS 52.0214-4582 DIRECTIONS FOR SUBMITTING BIDS/PROPOSALS
(APR 1992)

Envelopes containing bids/offers must be sealed, marked and addressed as follows:

MARK ENVELOPES:

Solicitation No. DACA05-97-B-0082
 Bid Opening/Offer Closing Date: 97 NOV 13
 Bid Opening/Offer Closing Time: 2:00 PM (LOCAL TIME)

ADDRESS ENVELOPES TO:

U.S. Army Engineer District, Sacramento
 Utah Area Office
 7227 6th Street, Bldg. 366
 Hill Air Force Base, Utah 84056-5214

Handcarried bids shall be deposited with the Corps of Engineers at the above address prior to bid opening time. For bidders planning to handcarry bids to Hill AFB for the Bid Opening, be sure to plan your time sufficiently. It may take at least 45 minutes to process you through the Visitors' Center to allow entry onto the base. There are Visitors' Centers located at the South and West Gates of the base. Be sure to bring: (1) a valid driver's license, (2) a valid car registration, and (3) proof of insurance. If you do not have all of these documents, you will not be allowed entry onto the base. If the Visitors' Center requires you to have authorization from a Corps of Engineers employee, call (801) 777-2206 or (801) 825-1505.

16. FAR 52.236-27 SITE VISIT (CONSTRUCTION) (FEB 1995), ALTERNATE I (FEB 1995)

(a) The clauses at 52.236-2, Differing Site Conditions, and 52.236-3, Site Investigations and Conditions Affecting the Work, will be included in any contract awarded as a result of this solicitation. Accordingly, offerors or quoters are urged and expected to inspect the site where the work will be performed.

(b) An organized site visit has been schedule for--
 Date & Time: 97 OCT 22 at 10:00 a.m.

(c) Participants will meet at--
 Location: The Resident Office, Hill AFB, Utah. Bidders cannot obtain access to the area without first giving the person's name and social security number at least 5 days in advance to the resident office. Phone (801) 777-2206.

17. SAACONS 52.0209-4501 CONTRACTOR RESPONSIBILITY, PREAWARD SURVEY (JUL 1995)

In order to determine a contractor's responsibility for purposes of contract award in accordance with FAR Part 9, the contractor is required to provide a statement regarding previous experience and past performance in performing comparable work, information related to the business organization, financial resources, and/or plant to be used in performing the work (see Attachments, Preaward Survey). The Preaward Survey is attached to the solicitation for information purposes only. It will be required from only the low bidder. After the Bid Opening, the Government will request this information from the low bidder if the low bidder has not had a contract with the Sacramento District within the last twelve months and the Government will set a due date for its submission. The Preaward Survey is not required as part of the bid package. In order to be determined to be responsible a prospective contractor must:

a. Have adequate financial resources to perform the contract or the ability to obtain them.

b. Be able to comply with the required or proposed delivery or performance schedule, taking into consideration all existing commercial and governmental business commitments.

c. Have a satisfactory performance record. In making the determination of responsibility, the Government Contracting Officer shall consider relevant past performance information. A prospective contractor shall not be determined responsible or nonresponsible solely on the basis of a lack of relevant performance history except when there are special standards set forth in the solicitation which applies to all bidders that must be met in order to receive the award. These special standards may be necessary when unusual expertise or specialized facilities are necessary in the performance of the contract; therefore, in order to be determined to be responsible for that particular contract, the offeror must be able to meet those special standards. A prospective contractor that is or recently has been seriously deficient in contract performance shall be presumed to be nonresponsible unless the Contracting Officer determines that the circumstances were beyond the contractor's control or that the contractor has taken appropriate corrective action. Other responsibility considerations by the Contracting Officer will include past efforts by the contractor to apply sufficient tenacity and perseverance to perform acceptably, to meet quality requirements of contracts, and the contractor's past compliance with subcontracting plans (if required) under recent contracts.

d. Have a satisfactory record of integrity and business ethics.

e. Have the necessary organization, experience, accounting and operational controls, and technical skills, or the ability to obtain them (including, as appropriate, such elements as production control procedures, property control systems, quality assurance measures, and safety programs applicable to materials to be produced or services to be performed by the prospective contractor and subcontractors).

f. Have the necessary production, construction, and technical equipment and facilities, or the ability to obtain them.

g. Be otherwise qualified and eligible to receive an award under applicable laws and regulations.

If the contractor or subcontractor does not already have sufficient resources demonstrated in the completed Preaward Survey, acceptable evidence of "the ability to obtain" the required, adequate resources (all of the resources discussed in subparagraphs a, e, and f above) normally consists of a commitment or explicit arrangement that will be in existence at the time of contract award to rent, purchase or otherwise acquire the needed facilities, equipment, other resources, or personnel. See also DFARS 252.219-7009 in this Section.

18. FAR 52.211-14 NOTICE OF PRIORITY RATING FOR NATIONAL DEFENSE USE (SEP 1990)

Any contract awarded as a result of this solicitation will be () DX rated order; (X) DO rated order certified for national defense use under the Defense Priorities and Allocations System (DPAS) (15 CFR Part 700), and the Contractor will be required to follow all of the requirements of this regulation.

19. DFARS 252.211-7002 AVAILABILITY FOR EXAMINATION OF SPECIFICATIONS, STANDARDS, PLANS, DRAWINGS, DATA ITEM DESCRIPTIONS, AND OTHER PERTINENT DOCUMENTS (DEC 1991)

The specifications, standards, plans, drawings, data item descriptions, and other pertinent documents cited in this solicitation are not available for distribution but may be examined at the following location:

US Army Engineer District, Sacramento
Plan Room
1325 J Street
Sacramento CA 95814-2922

20. SAACONS 52.0211-4805 AVAILABILITY OF SPECIFICATIONS, STANDARDS AND DESCRIPTIONS (OCT 1992)

(a) Specifications, standards and descriptions cited in this solicitation are available as indicated below:

(1) Unclassified Federal, Military and Other Specifications and Standards (Excluding Commercial) and Data Item Descriptions: Single copies of specifications cited in this solicitation may be obtained by submitting a written request to the supply point listed below. The request must contain the title of the specification, its number, date and applicable amendments. A telephone order entry system is available with the use of a touch tone telephone. A Customer Number is required to use this system and may be obtained by written request to the address listed below or by telephone (215) 697-2179. In case of urgency, telegraphic requests are acceptable.

Standardization Document
Order Desk, Building 4, Section D
700 Robbins Avenue
Philadelphia PA 19111-5094

Telex Number: 834295
Western Union Number: 710-670-1685
Telephone Number: (215) 697-3321
FAX Number: (215) 697-2978
Telephone Order Entry System (TOES) Numbers: (215) 697-1187 through and including (215) 697-1197

(b) Commercial Specifications, Standards and Descriptions: These specifications, standards and descriptions are not available from Government sources. They may be obtained from the publishers.

(c) The Department of Defense Index of Data Item Descriptions (TD-3) may be ordered on the DD Form 1425. The Department of Defense Index of Specifications and Standards (DODISS) may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

(d) Corps of Engineers Publications: The "CRD" series of Corps of Engineers specifications are available for inspection at this office. Copies can be obtained from the U.S. Army Engineer Waterways Experiment Station, ATTN: Publications Distribution, Information Services Branch, P.O. Box 631, Vicksburg, Mississippi 39180. A copy of the Corps of Engineers manual, EM 385-1-1, entitled "Safety and Health Requirements Manual" will be sent to prospective bidders upon request to the Sacramento District Office.

21. SAACONS 52.0214-4583 TELEGRAPHIC BIDS/OFFERS (APR 1992)

TELEGRAPHIC BIDS/OFFERS ARE NOT ACCEPTABLE.

However, bids/offers may be modified or withdrawn by written or telegraphic notice. Any telegram to modify or withdraw a bid/offer sent to this office must be received in the office designated in the Invitation for Bids/Request for Proposal (IFB/RFP) for receipt of bids/offers not later than the exact

date and time set for bid opening/receipt of proposals. A telegraphic modification or withdrawal of a bid/offer received in such office by telephone from the receiving telegraph office not later than the exact date and time set for bid opening/receipt of proposals shall be considered. However, the telephone message shall be confirmed by the telegraph company by sending a copy of the written telegram that formed the basis for the telephone call. The written telegram shall be sealed in an envelope by a proper official and sent to the office designated in the IFB/RFP for receipt of bids/offers. The official shall write on the envelope (1) the date and time of receipt and by whom, and (2) the number of the IFB/RFP, and shall sign the envelope. The bidder/offeror is responsible to inform the telegraph company of these requirements. No one from this office will be dispatched to the local telegraph office to pick up any telegram for any reason.

22. SAACONS 52.0214-4584 FACSIMILE BIDS/OFFERS (APR 1992)

Facsimile bids/offers, modifications thereto, or cancellations of bids/offers will not be accepted.

23. FAR 52.216-1 TYPE OF CONTRACT (APR 1984)

The Government contemplates award of a firm, fixed-price contract resulting from this solicitation.

24. SAACONS 52.0219-4581 PREPARATION OF SUBCONTRACTING PLAN (APR 1994)

(a) See FAR 52.219-9, Section 00700, of this solicitation. Located in the Attachments Section of this solicitation is a sample Subcontracting Plan which will aid the Contractor in preparing a Subcontracting Plan in accordance with FAR 52.219-9(d)(1) through (d)(11). Subcontracting Plans will be developed considering only the subcontracts actually to be awarded. Subcontracting Plans are required only from large business firms if the contract price is over \$1 million; they are not required from small business firms regardless of the contract price.

(b) The sample Subcontracting Plan is attached to this solicitation for information purposes. A Subcontracting Plan will be required only from the low bidder if the low bidder is a large business and the low bid is over \$1 million. The Subcontracting Plan is not required from the low bidder until after the Bid Opening; it is not required as part of the bid package. After the Bid Opening, if the selected bidder fails to submit an acceptable plan within the time prescribed by the Contracting Officer, the bidder will be ineligible for award. Review of the Subcontracting Plan by the Government will be in accordance with FAR 19.705-4.

(c) A Subcontracting Plan which proposes goals less than the recommended goals below must contain support, in writing, for the lesser goals and discuss the Contractor's good faith effort to meet the recommended goals.

(d) In accordance with FAR 19.704 if the contract contains options, the cumulative value of the basic contract and all options is considered in determining whether a Subcontracting Plan is necessary. If a plan is necessary, the Subcontracting Plan shall contain separate parts, one for the basic contract and one for each option. It is necessary to address planned subcontracting dollars and percentages of total to be awarded to small; small, disadvantaged; women-owned small; HBCU/MIs; and qualified nonprofit agencies for the blind and other severely disabled separately for the basic contract period and each option year. All other parts of the Subcontracting Plan only need to be addressed once.

(e) Subcontracts awarded to small, disadvantaged businesses; women-owned small businesses; HBCU/MIs; and qualified nonprofit agencies for the blind and

other severely disabled count toward the overall small business goal. HBCU/MIs are counted as a subset of the small, disadvantaged goal. The Corps of Engineers has not been assigned a set goal for HBCU/MIs or qualified nonprofit agencies for the blind and other severely disabled.

(f) Qualified nonprofit agencies for the blind and other severely disabled that have been approved by the Committee for Purchase from People Who Are Blind or Severely Disabled under the Javits-Wagner-O'Day Act (41 U.S.C. 46-48) are eligible as a result of Section 9077 of Pub. L. 102-395 and subsequent Appropriation Acts and Section 808 of Pub. L. 102-484 and 804 of Pub. L. 103-337 through September 30 1997 to participate in the program. Under this authority subcontracts awarded to such entities may be counted toward the prime contractor's small business subcontracting goal through fiscal year 1997.

(g) Contact - Mr. John Szabo (916)557-5202, Deputy for Small Business, with questions on the Subcontracting Plan requirements and further instructions on submission of Standard Forms 294 and 295 as required by FAR 52.219-9. These forms with clarifying instructions will be furnished by the Deputy for Small Business to the Contractor's Subcontracting Plan Administrator after contract award.

(h) The accepted Subcontracting Plan will be incorporated into and made a material part of the contract.

(i) The Corps of Engineers highly encourages all bidders/ offerors to meet the recommended subcontracting goals as follows:

Small Businesses	55.0%
Small, Disadvantaged Businesses	8.5%
Women-Owned Small Businesses	3.0%

The goals are calculated as a percentage of the TOTAL SUBCONTRACTING DOLLARS, NOT THE TOTAL CONTRACT AMOUNT.

NOTE: A CONTRACT AWARD BY THE GOVERNMENT TO A HIGHER EDUCATIONAL INSTITUTION (HEI) UNIVERSITY AND/OR COLLEGE WILL REQUIRED THE HEI TO CONSIDER AND AWARD 5% (TOTAL DOLLARS) TO HISTORICALLY BLACK COLLEGES, UNIVERSITIES AND MINORITY INSTITUTIONS (HBCU/MI).

25. FAR 52.222-23 NOTICE OF REQUIREMENT FOR AFFIRMATIVE ACTION TO ENSURE EQUAL EMPLOYMENT OPPORTUNITY (APR 1984)

(a) The offeror's attention is called to the Equal Opportunity clause and the Affirmative Action Compliance Requirements for Construction clause of this solicitation.

(b) The goals for minority and female participation, expressed in percentage terms for the Contractor's aggregate workforce in each trade on all construction work in the covered area, are as follows:

Goals for minority participation for each trade	Goals for female participation for each trade
6.0%	6.9%

These goals are applicable to all the Contractor's construction work performed in the covered area. If the Contractor performs construction work in a geographical area located outside of the covered area, the Contractor shall apply the goals established for the geographical area where the work is

actually performed. Goals are published periodically in the Federal Register in notice form, and these notices may be obtained from any Office of Federal Contract Compliance Programs office.

(c) The Contractor's compliance with Executive Order 11246, as amended, and the regulations in 41 CFR 60-4 shall be based on (1) its implementation of the Equal Opportunity clause, (2) specific affirmative action obligations required by the clause entitled "Affirmative Action Compliance Requirements for Construction," and (3) its efforts to meet the goals. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade. The Contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor, or from project to project, for the sole purpose of meeting the Contractor's goals shall be a violation of the contract, Executive Order 11246, as amended, and the regulations in 41 CFR 60-4. Compliance with the goals will be measured against the total work hours performed.

(d) The Contractor shall provide written notification to the Director, Office of Federal Contract Compliance Programs, within 10 working days following award of any construction subcontract in excess of \$10,000 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the--

- (1) Name, address, and telephone number of the subcontractor;
- (2) Employer's identification number of the subcontractor;
- (3) Estimated dollar amount of the subcontract;
- (4) Estimated starting and completion dates of the subcontract; and
- (5) Geographical area in which the subcontract is to be performed.

(e) As used in this Notice, and in any contract resulting from this solicitation, the "covered area" is Davis, Salt Lake, Tooele and Weber counties, Utah.

26. SAACONS 52.0228-4504 PERFORMANCE AND PAYMENT BONDS
(AUG 1991)

The bidder/offeror whose bid/offer is accepted will, within the time established in the bid, enter into a written contract with the Government and furnish performance and payment bonds on Government Standard Forms in the amounts indicated.

Within ten (10) calendar days after award and prior to Notice to Proceed the contractor shall furnish two bonds, each with good and sufficient surety or sureties acceptable to the Government, namely a performance bond (Standard Form 25) and a payment bond (Standard Form 25-A). The penal sum of such bonds will be as follows:

a. Performance Bond. The penal amount of performance bond shall be one hundred percent (100%) of the original contract price.

b. Payment Bond. The penal amount of payment bond shall equal (i) fifty percent (50%) of the contract price when the contract price is \$1,000,000 or less; (ii) forty percent (40%) of the contract price when the contract price is in excess of \$1,000,000 but not more than \$5,000,000; (iii) \$2,500,000 when the contract price is more than \$5,000,000.

Any bonds furnished will be furnished by the contractor to the Government prior to Notice to Proceed and commencement of contract performance.

27. SAACONS 52.0228-4506 INDIVIDUAL SURETIES IN SUPPORT OF BID
BONDS (AUG 1991)

Bidders/offerors utilizing individual sureties in support of a bid bond shall include a Standard Form (SF) 28 (Affidavit of Individual Surety), accompanied by a pledge of acceptable assets from each person acting as an

individual surety, and include these with the SF 24 (Bid Bond), and the bid itself (see clause titled "Pledges of Assets," FAR 52.228-11).

Pledges of acceptable assets shall be in the form of (1) evidence of an escrow account and/or (2) a recorded lien on real estate. If this is an IFB, failure to provide pledges of acceptable assets, with the bid, in the specified form, accompanied by a properly executed SF 24 and SF 28, will render the bidder nonresponsible and thus ineligible for award. If this is an RFP, failure to provide required documentation described herein may cause the offeror to be deemed "unacceptable".

28. SAACONS 52.228-4507 BID GUARANTEE FORM AND AMOUNT (JAN 1993)

When bids/proposals exceed \$25,000, the offeror shall furnish a separate bid guarantee in accordance with the solicitation provision titled "Bid Guarantee", FAR 52.228-1. In accordance with FAR 28.101-2 the bid guarantee amount shall be at least 20 percent of the "bid price" but shall not exceed \$3 million. When the penal sum is expressed as a percentage, a maximum dollar limitation may be stated. If there are option line items on the Pricing Schedule (Section 00010), the term "bid price" is hereby defined as the total bid not to include any amount for line items designated as "options". In bids/proposals that contain "additives", the "bid price" is defined as the total of all bid items including additive line items. FAR 28.106-1 states that a Standard Form (SF) 24 shall be used for the bid bond. In accordance with FAR 28.202(a)(1), corporate sureties utilized must appear on the list contained in the Department of Treasury Circular 570 titled "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and Acceptable Reinsuring Companies."

29. DFARS 252.228-7004 BONDS OR OTHER SECURITY (DEC 1991)

(a) Offerors shall furnish a bid guarantee in the amount of 20% of bid/offer with their bids/offers. The offeror receiving notice of award shall furnish--

- (1) A performance bond in the penal amount of 100% of contract price; and
- (2) Payment in full of any sum due the Government.

(b) The Contractor shall furnish the performance bond to the Contracting Officer within ten (10) days after receipt of the notice of award. The Contracting Officer will not issue the notice to proceed until receipt of an acceptable performance bond and payment of any sum due the Government.

(c) Bonds supported by sureties whose names appear on the list contained in Treasury Department Circular 570 are acceptable. Performance bonds from individual sureties are acceptable if each person acting as a surety provides a SF 28, Affidavit of Individual Surety, and a pledge of assets acceptable to the Contracting Officer.

30. FAR 52.233-2 SERVICE OF PROTEST (AUG 1996)

(a) Protests, as defined in section 33.101 of the Federal Acquisition Regulation, that are filed directly with an agency, and copies of any protests that are filed with the General Accounting Office (GAO), shall be served on the Contracting Officer (addressed as follows) by obtaining written and dated acknowledgment of receipt from:

Contracting Officer
1325 J Street, Rm 878
Sacramento, California 95814

(b) The copy of any protest shall be received in the office designated above within one day of filing a protest with the GAO.

31. SAACONS 52.0236-4507 ACCEPTANCE OF OFFERS (AUG 1991)

A written award or acceptance of an offer, mailed or otherwise furnished to the successful offeror within the time for acceptance specified in the offer, shall result in a binding contract without further action by either party.

32. FAR 52.252-3 ALTERATIONS IN SOLICITATION
(APR 1984)

Portions of this solicitation are altered as follows: N/A

33. FAR 52.252-5 AUTHORIZED DEVIATIONS IN PROVISIONS
(APR 1984)

(a) The use in this solicitation of any Federal Acquisition Regulation (48 CFR Chapter 1) provision with an authorized deviation is indicated by the addition of "(DEVIATION)" after the date of the provision.

(b) The use in this solicitation of any (48 CFR Chapter 2) provision with an authorized deviation is indicated by the addition of "(DEVIATION)" after the name of the regulation.

EVALUATION CRITERIA FOR AWARD:

34. SAACONS 52.0214-4503 EVALUATION FOR AWARD (JAN 1991)

The Government contemplates award of one contract to the responsive, responsible bidder who submits the low bid for the total of the following items in Pricing Schedule:

All line items listed in Pricing Schedule.

If the solicitation's Pricing Schedule contains options, see evaluation of options clause for information on the procedure used by the Government to determine "low bid".

END OF SECTION

SECTION 00600

REPRESENTATIONS, CERTIFICATIONS
AND OTHER STATEMENTS OF BIDDERS/OFFERORS

SECTION 00600

REPRESENTATIONS, CERTIFICATIONS
AND OTHER STATEMENTS OF BIDDERS/OFFERORS

1. FAR 52.252-1 SOLICITATION PROVISIONS INCORPORATED BY
REFERENCE (JUN 1988)

This solicitation incorporates one or more solicitation provisions by reference, with the same force and effect as if they were given in full text. Upon request, the Contracting Officer will make their full text available.

SOLICITATION PROVISIONS BY REFERENCE:

2. DFARS 252.209-7001 DISCLOSURE OF OWNERSHIP OR CONTROL BY THE
GOVERNMENT OF A TERRORIST COUNTRY
(SEP 1994)
3. DFARS 252.209-7003 DISCLOSURE OF COMMERCIAL TRANSACTION WITH THE
GOVERNMENT OF A TERRORIST COUNTRY
(SEP 1994)
4. FAR 52.214-17 AFFILIATED BIDDERS (APR 1984)
(APPLICABLE IF SEALED BIDDING)
5. FAR 52.222-21 CERTIFICATION OF NONSEGREGATED FACILITIES
(APR 1984)
6. FAR 52.223-5 POLLUTION PREVENTION AND RIGHT-TO-KNOW
INFORMATION (MAR 1997)
(APPLICABLE IN ALL SOLICITATIONS AND CONTRACTS
THAT PROVIDE FOR PERFORMANCE, IN WHOLE OR IN
PART, ON A FEDERAL FACILITY)

THE FOLLOWING SOLICITATION PROVISIONS ARE INCLUDED IN FULL TEXT

7. SAACONS 52.0201.4801 SUBMITTAL INFORMATION (NOV 1993)
8. FAR 52.203-2 CERTIFICATE OF INDEPENDENT PRICE DETERMINATION
(APR 1985)
9. FAR 52.203-11 CERTIFICATION AND DISCLOSURE REGARDING PAYMENTS
TO INFLUENCE CERTAIN FEDERAL TRANSACTIONS
(APR 1991)
10. FAR 52.204-3 TAXPAYER IDENTIFICATION (MAR 1994)
11. FAR 52.204-5 WOMEN-OWNED BUSINESS (OCT 1995)
12. FAR 52.209-5 CERTIFICATION REGARDING DEBARMENT, SUSPENSION,
PROPOSED DEBARMENT, AND OTHER RESPONSIBILITY
MATTERS (MAR 1996)
13. FAR 52.214-2 TYPE OF BUSINESS ORGANIZATION--SEALED BIDDING
(JUL 1987)
16. FAR 52.219-1 SMALL BUSINESS PROGRAM REPRESENTATION (JAN 1997)
14. FAR 52.219-2 EQUAL LOW BIDS (OCT 1995)
15. FAR 52.219-19 SMALL BUSINESS CONCERN REPRESENTATION FOR THE
SMALL BUSINESS COMPETITIVENESS DEMONSTRATION
PROGRAM (JAN 1997)
16. DFARS 252.219-7000 SMALL DISADVANTAGED BUSINESS CONCERN
REPRESENTATION (DOD CONTRACTS (APR 1994)
17. FAR 52.222-22 PREVIOUS CONTRACTS AND COMPLIANCE REPORTS
(APR 1984)
18. FAR 52.223-1 CLEAN AIR AND WATER CERTIFICATION
(APR 1984)

- 19. FAR 52.223-3 HAZARDOUS MATERIAL IDENTIFICATION AND MATERIAL SAFETY DATA (JAN 1997)
- 20. FAR 52.223-13 CERTIFICATION OF TOXIC CHEMICAL RELEASE REPORTING (OCT 1996)
- 21. DFARS 252.223-7001 HAZARD WARNING LABELS (DEC 1991)
- 22. 52.225-7006 BUY AMERICAN ACT--TRADE AGREEMENTS--BALANCE OF PAYMENTS PROGRAM CERTIFICATE (JAN 1994)
- 23. DFARS 252.225-7035 BUY AMERICAN ACT--NORTH AMERICAN FREE TRADE AGREEMENT IMPLEMENTATION ACT--BALANCE OF PAYMENTS PROGRAM CERTIFICATE (MAY 1995)
- 24. DFARS 252.247-7022 REPRESENTATION OF EXTENT OF TRANSPORTATION BY SEA (AUG 1992)

FULL TEXT SOLICITATION PROVISIONS:

7. SAACONS 52.0201.4801 SUBMITTAL INFORMATION (NOV 1993)

Solicitation Number: _____

Offeror's Name, Address, Telephone Number, and Fax Number:

_____	_____
Name of Person to Contact	Telephone Number

Fax Number

Commercial & Government Entity (CAGE) Code, if known
(see Section 00100):

DUNS Number, if known:

8. FAR 52.203-2 CERTIFICATE OF INDEPENDENT PRICE DETERMINATION
(APR 1985)

(a) The offeror certifies that--

(1) The prices in this offer have been arrived at independently, without, for the purpose of restricting competition, any consultation, communication, or agreement with any other offeror or competitor relating to (i) those prices, (ii) the intention to submit an offer, or (iii) the methods or factors used to calculate the prices offered;

(2) The prices in this offer have not been and will not be knowingly disclosed by the offeror, directly or indirectly, to any other offeror or competitor before bid opening (in the case of a sealed bid solicitation) or contract award (in the case of a negotiated solicitation) unless otherwise required by law; and

(3) No attempt has been made or will be made by the offeror to induce any other concern to submit or not to submit an offer for the purpose of restricting competition.

(b) Each signature on the offer is considered to be a certification by the signatory that the signatory--

(1) Is the person in the offeror's organization responsible for determining the prices being offered in this bid or proposal, and that the signatory has not participated and will not participate in any action contrary to subparagraphs (a)(1) through (a)(3) above; or

(2)(i) Has been authorized, in writing, to act as agent for the following principals in certifying that those principals have not participated, and will not participate in any action contrary to subparagraphs (a)(1) through (a)(3) above

(insert full name of person(s) in the offeror's organization responsible for determining the prices offered in this bid or proposal, and the title of his or her position in the offeror's organization);

(ii) As an authorized agent, does certify that the principals named in subdivision (b)(2)(i) above have not participated, and will not participate, in any action contrary to subparagraphs (a)(1) through (a)(3) above; and

(iii) As an agent, has not personally participated, and will not participate, in any action contrary to subparagraphs (a)(1) through (a)(3) above.

(c) If the offeror deletes or modifies subparagraph (a)(2) above, the offeror must furnish with its offer a signed statement setting forth in detail the circumstances of the disclosure.

9. FAR 52.203-11

CERTIFICATION AND DISCLOSURE REGARDING PAYMENTS
TO INFLUENCE CERTAIN FEDERAL TRANSACTIONS
(APR 1991)

(a) The definitions and prohibitions contained in the clause, at FAR 52.203-12, Limitation on Payments to Influence Certain Federal Transactions, included in this solicitation, are hereby incorporated by reference in paragraph (b) of this certification.

(b) The offeror, by signing its offer, hereby certifies to the best of his or her knowledge and belief that on or after December 23, 1989,--

(1) No Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress on his or her behalf in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment or modification of any Federal contract, grant, loan, or cooperative agreement;

(2) If any funds other than Federal appropriated funds (including profit or fee received under a covered Federal transaction) have been paid, or will be paid, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress on his or her behalf in connection with this solicitation, the offeror shall complete and submit, with its offer, OMB standard form LLL, Disclosure of Lobbying Activities, to the Contracting Officer; and

(3) He or she will include the language of this certification in all subcontract awards at any tier and require that all recipients of subcontract awards in excess of \$100,000 shall certify and disclose accordingly.

(c) Submission of this certification and disclosure is a prerequisite for making or entering into this contract imposed by section 1352, title 31, United States Code. Any person who makes an expenditure prohibited under this provision or who fails to file or amend the disclosure form to be filed or amended by this provision, shall be subject to a civil penalty of not less than \$10,000, and not more than \$100,000, for each such failure.

10. FAR 52.204-3

TAXPAYER IDENTIFICATION (MAR 1994)

(a) Definitions.

"Common parent," as used in this solicitation provision, means that corporate entity that owns or controls an affiliated group of corporations that files its Federal income tax returns on a consolidated basis, and of which the offeror is a member.

"Corporate status," as used in this solicitation provision, means a designation as to whether the offeror is a corporate entity, an unincorporated entity (e.g., sole proprietorship or partnership), or a corporation providing medical and health care services.

"Taxpayer Identification Number (TIN)," as used in this solicitation provision, means the number required by the IRS to be used by the offeror in reporting income tax and other returns.

(b) All offerors are required to submit the information required in paragraphs (c) through (e) of this solicitation provision in order to comply

with reporting requirements of 26 U.S.C. 6041, 6041A, and 6050M and implementing regulations issued by the Internal Revenue Service (IRS). If the resulting contract is subject to the reporting requirements described in FAR 4.903, the failure or refusal by the offeror to furnish the information may result in a 31 percent reduction of payments otherwise due under the contract.

(c) Taxpayer Identification Number (TIN).

☐ TIN: _____.

☐ TIN has been applied for.

☐ TIN is not required because:

☐ Offeror is a nonresident alien, foreign corporation, or foreign partnership that does not have income effectively connected with the conduct of a trade or business in the U.S. and does not have an office or place of business or a fiscal paying agent in the U.S.;

☐ Offeror is an agency or instrumentality of a foreign government;

☐ Offeror is an agency or instrumentality of a Federal, state, or local government;

☐ Other. State basis. _____

(d) Corporate Status.

☐ Corporation providing medical and health care services, or engaged in the billing and collecting of payments for such services;

☐ Other corporate entity;

☐ Not a corporate entity;

☐ Sole proprietorship

☐ Partnership

☐ Hospital or extended care facility described in 26 CFR 501(c)(3) that is exempt from taxation under 26 CFR 501(a).

(e) Common Parent.

☐ Offeror is not owned or controlled by a common parent as defined in paragraph (a) of this clause.

☐ Name and TIN of common parent:

Name _____

TIN _____

11. FAR 52.204-5

WOMEN-OWNED BUSINESS (OCT 1995)

(a) Representation. The offeror represents that it () is, () is not a women-owned business concern.

(b) Definition. "Women-owned business concern," as used in this provision, means a concern which is at least 51 percent owned by one or more women; or in the case of any publicly owned business, at least 51 percent of the stock of which is owned by one or more women; and whose management and daily business operations are controlled by one or more women.

12. FAR 52.209-5

CERTIFICATION REGARDING DEBARMENT, SUSPENSION, PROPOSED DEBARMENT, AND OTHER RESPONSIBILITY MATTERS (MAR 1996)

(a)(1) The Offeror certifies, to the best of its knowledge and belief, that--

(i) The Offeror and/or any of its Principals--

(A) Are / / are not / / presently debarred, suspended, proposed for debarment, or declared ineligible for the award of contracts by any Federal agency;

(B) Have / / have not / /, within a three-year period preceding this offer, been convicted of or had a civil judgment rendered against them for: commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, state, or local) contract or subcontract; violation of Federal or state antitrust statutes relating to the submission of offers; or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property; and

(C) Are / / are not / / presently indicted for, or otherwise criminally or civilly charged by a governmental entity with, commission of any of the offenses enumerated in subdivision (a)(1)(i)(B) of this provision.

(ii) The Offeror has / / has not / /, within a three-year period preceding this offer, had one or more contracts terminated for default by any Federal agency.

(2) "Principals," for the purposes of this certification, means officers; directors; owners; partners; and, persons having primary management or supervisory responsibilities within a business entity (e.g., general manager; plant manager; head of a subsidiary, division, or business segment, and similar positions).

THIS CERTIFICATION CONCERNS A MATTER WITHIN THE JURISDICTION OF AN AGENCY OF THE UNITED STATES AND THE MAKING OF A FALSE, FICTITIOUS, OR FRAUDULENT CERTIFICATION MAY RENDER THE MAKER SUBJECT TO PROSECUTION UNDER SECTION 1001, TITLE 18, UNITED STATES CODE.

(b) The Offeror shall provide immediate written notice to the Contracting Officer if, at any time prior to contract award, the Offeror learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

(c) A certification that any of the items in paragraph (a) of this provision exists will not necessarily result in withholding of an award under this solicitation. However, the certification will be considered in connection with a determination of the Offeror's responsibility. Failure of the Offeror to furnish a certification or provide such additional information as requested by the Contracting Officer may render the Offeror nonresponsible.

(d) Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render, in good faith, the certification required by paragraph (a) of this provision. The knowledge and information of an Offeror is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

(e) The certification in paragraph (a) of this provision is a material representation of fact upon which reliance was placed when making award. If it is later determined that the Offeror knowingly rendered an erroneous certification, in addition to other remedies available to the Government, the Contracting Officer may terminate the contract resulting from this solicitation for default.

13. FAR 52.214-2

TYPE OF BUSINESS ORGANIZATION--SEALED BIDDING
(JUL 1987)

The bidder, by checking the applicable box, represents that--

(a) It operates as ☐ a corporation incorporated under the laws of the State of _____, ☐ an individual, ☐ a partnership, ☐ a nonprofit organization, or ☐ a joint venture; or

(b) If the bidder is a foreign entity, it operates as ☐ an individual, ☐ a partnership, ☐ a nonprofit organization, ☐ a joint venture, or ☐ a corporation, registered for business in _____. (country)

16. FAR 52.219-1

SMALL BUSINESS PROGRAM REPRESENTATION (JAN 1997)

(a)(1) The standard industrial classification (SIC) code for this acquisition is 1629 - Heavy Construction, Except Dredging, Not Elsewhere Classified.

(2) The small business size standard is \$17,000,000

(3) The small business size standard for a concern which submits an offer in its own name, other than on a construction or service contract, but which proposes to furnish a product which it did not itself manufacture, is 500 employees.

(b) Representations. (1) The offeror represents as part of its offer that it / / is, / / is not a small business concern.

(2) (Complete only if offeror represented itself as a small business concern in block (b)(1) of this section.) The offeror represents as part of its offer that it / / is, / / is not a women-owned small business concern.

(c) Definitions. "Joint venture," for purposes of a small disadvantaged business (SDB) set-aside or price evaluation preference (as prescribed at 13 CFR 124.321), is a concern that is owned and controlled by one or more socially and economically disadvantaged individuals entering into a joint venture agreement with one or more business concerns and is considered to be affiliated for size purposes with such other concern(s). The combined annual receipts or employees of the concerns entering into the joint venture must meet the applicable size standard corresponding to the SIC code designated for the contract. The majority of the venture's earnings must accrue directly to the socially and economically disadvantaged individuals in the SDB concerns(s) in the joint venture. The percentage of the ownership involvement in a joint venture by disadvantaged individuals must be at least 51 percent.

"Small business concern," as used in this provision, means a concern, including its affiliates, that is independently owned and operated, not dominant in the field of operation in which it is bidding on Government contracts, and qualified as a small business under the criteria in 13 CFR Part 121 and the size standard in paragraph (a) of this provision.

"Small disadvantaged business concern," as used in this provision, means a small business concern that (1) is at least 51 percent unconditionally owned by one or more individuals who are both socially and economically disadvantaged, or a publicly owned business having at least 51 percent of its stock unconditionally owned by one or more socially and economically disadvantaged individuals, and (2) has its management and daily business controlled by one or more such individuals. This term also means a small business concern that is at least 51 percent unconditionally owned by an economically disadvantaged Indian tribe or Native Hawaiian Organization, or a publicly owned business having at least 51 percent of its stock unconditionally owned by one or more of these entities, which has its management and daily business controlled by members of an economically disadvantaged Indian tribe or Native Hawaiian Organization, and which meets the requirements of 13 CFR Part 124.

"Women-owned small business concern," as used in this provision, means a small business concern--

(1) Which is at least 51 percent owned by one or more women or, in the case of any publicly owned business, at least 51 percent of the stock of which is owned by one or more women; and

(2) Whose management and daily business operations are controlled by one or more women.

(d) Notice. (1) If this solicitation is for supplies and has been set aside, in whole or in part, for small business concerns, then the clause in this solicitation providing notice of the set-aside contains restrictions on the source of the end items to be furnished.

(2) Under 15 U.S.C. 645(d), any person who misrepresents a firm's status as a small or small disadvantaged business concern in order to obtain a contract to be awarded under the preference programs established pursuant to sections 8(a), 8(d), 9, or 15 of the Small Business Act or any other provision of Federal law that specifically references section 8(d) for a definition of program eligibility, shall--

(i) Be punished by imposition of a fine, imprisonment, or both;

(ii) Be subject to administrative remedies, including suspension and debarment; and

(iii) Be ineligible for participation in programs conducted under the authority of the Act.

14. FAR 52.219-2

EQUAL LOW BIDS (OCT 1995)

(a) This provision applies to small business concerns only.

(b) The bidder's status as a labor surplus area (LSA) concern may affect entitlement to award in case of tie bids. If the bidder wishes to be

considered for this priority, the bidder must identify, in the following space, the LSA in which the costs to be incurred on account of manufacturing or production (by the bidder of the first-tier subcontractors) amount to more than 50 percent of the contract price.

(c) Failure to identify the labor surplus areas as specified in paragraph (b) of this provision will preclude the bidder from receiving priority consideration. If the bidder is awarded a contract as a result of receiving priority consideration under this provision and would not have otherwise received award, the bidder shall perform the contract or cause the contract to be performed in accordance with the obligations of an LSA concern.

15. FAR 52.219-19 SMALL BUSINESS CONCERN REPRESENTATION FOR THE
SMALL BUSINESS COMPETITIVENESS DEMONSTRATION
PROGRAM (JAN 1997)

(a) Definition.

"Emerging small business" as used in this solicitation, means a small business concern whose size is no greater than 50 percent of the numerical size standard applicable to the standard industrial classification code assigned to a contracting opportunity.

(b) (Complete only if the Offeror has represented itself under the provision at 52.219-1 as a small business concern under the size standards of this solicitation.)

The Offeror represents and certifies as part of its offer that it /___/ is, /___/ is not an emerging small business.

(c) (Complete only if the Offeror is a small business or an emerging small business, indicating its size range.)

Offeror's number of employees for the past 12 months (check this column if size standard stated in solicitation is expressed in terms of number of employees) or Offeror's average annual gross revenue for the last 3 fiscal years (check this column if size standard stated in solicitation is expressed in terms of annual receipts). (Check one of the following.)

No. of Employees	Avg. Annual Gross Revenues
___ 50 or fewer	___ \$1 million or less
___ 51-100	___ \$1,000,001-\$2 million
___ 101-250	___ \$2,000,001-\$3.5 million
___ 251-500	___ \$3,500,001-\$5 million
___ 501-750	___ \$5,000,001-\$10 million
___ 751-1,000	___ \$10,000,001-\$17 million
___ Over 1,000	___ Over \$17 million

16. DFARS 252.219-7000 SMALL DISADVANTAGED BUSINESS CONCERN
REPRESENTATION (DOD CONTRACTS
(APR 1994)

(a) Definition. "Small disadvantaged business concern," as used in this provision, means a small business concern, owned and controlled by individuals who are both socially and economically disadvantaged, as defined by the Small Business Administration at 13 CFR Part 124, the majority of earnings of which directly accrue to such individuals. This term also means a small business concern owned and controlled by an economically disadvantaged Indian tribe or Native Hawaiian organization which meets the requirements of 13 CFR 124.112 or

13 CFR 124.113, respectively. In general, 13 CFR Part 124 describes a small disadvantaged business concern as a small business concern--

(1) Which is at least 51 percent unconditionally owned by one or more socially and economically disadvantaged individuals; or

(2) In the case of any publicly owned business, at least 51 percent of the voting stock is unconditionally owned by one or more socially and economically disadvantaged individuals; and

(3) Whose management and daily business operations are controlled by one or more such individuals.

(b) Representations. Check the category in which your ownership falls--
 _____ Subcontinent Asian (Asian-Indian) American (U.S. citizen with origins from India, Pakistan, Bangladesh, Sri Lanka, Bhutan, or Nepal)

_____ Asian-Pacific American (U.S. citizen with origins from Japan, China, the Philippines, Vietnam, Korea, Samoa, Guam, U.S. Trust Territory of the Pacific Islands (Republic of Palau), the Northern Mariana Islands, Laos, Kampuchea (Cambodia), Taiwan, Burma, Thailand, Malaysia, Indonesia, Singapore, Brunei, Republic of the Marshall Islands, or the Federated States of Micronesia)

_____ Black American (U.S. citizen)

_____ Hispanic American (U.S. citizen with origins from South America, Central America, Mexico, Cuba, the Dominican Republic, Puerto Rico, Spain, or Portugal)

_____ Native American (American Indians, Eskimos, Aleuts, or Native Hawaiians, including Indian tribes or Native Hawaiian organizations)

_____ Individual/concern, other than one of the preceding, currently certified for participation in the Minority Small Business and Capital Ownership Development Program under Section 8(a) of the Small Business Act

_____ Other

(c) Certifications. Complete the following--

(1) The offeror is _____ is not _____ a small disadvantaged business concern.

(2) The Small Business Administration (SBA) has _____ has not _____ made a determination concerning the offeror's status as a small disadvantaged business concern. If the SBA has made a determination, the date of the determination was _____ and the offeror--

_____ Was found by SBA to be socially and economically disadvantaged and no circumstances have changed to vary that determination.

_____ Was found by SBA not to be socially and economically disadvantaged but circumstances which caused the determination have changed.

(d) Penalties and Remedies. Anyone who misrepresents the status of a concern as a small disadvantaged business for the purpose of securing a contract or subcontract shall--

(1) Be punished by imposition of a fine, imprisonment, or both;

(2) Be subject to administrative remedies, including suspension and debarment; and

(3) Be ineligible for participation in programs conducted under authority of the Small Business Act.

17. FAR 52.222-22

PREVIOUS CONTRACTS AND COMPLIANCE REPORTS
(APR 1984)

The offeror represents that--

(a) It /_/ has, /_/ has not, participated in a previous contract or subcontract subject either to the Equal Opportunity clause of this solicitation, the clause originally contained in Section 310 of Executive Order No. 10925, or the clause contained in Section 201 of Executive Order No. 11114;

(b) It /_/ has, /_/ has not, filed all required compliance reports; and

(c) Representations indicating submission of required compliance reports, signed by proposed subcontractors, will be obtained before subcontract awards.

18. FAR 52.223-1

CLEAN AIR AND WATER CERTIFICATION
(APR 1984)

The Offeror certifies that--

(a) Any facility to be used in the performance of this proposed contract is /_/ is not /_/ listed on the Environmental Protection Agency (EPA) List of Violating Facilities;

(b) The Offeror will immediately notify the Contracting Officer, before award, of the receipt of any communication from the Administrator, or a designee, of the EPA, indicating that any facility that the Offeror proposes to use for the performance of the contract is under consideration to be listed on the EPA List of Violating Facilities; and

(c) The Offeror will include a certification substantially the same as this certification, including this paragraph (c), in every nonexempt subcontract.

19. FAR 52.223-3

HAZARDOUS MATERIAL IDENTIFICATION AND MATERIAL
SAFETY DATA (JAN 1997)

(a) "Hazardous material," as used in this clause, includes any material defined as hazardous under the latest version of Federal Standard No. 313 (including revisions adopted during the term of the contract).

(b) The Offeror must list any hazardous material, as defined in paragraph (a) of this clause, to be delivered under this contract. The hazardous material shall be properly identified and include any applicable identification number, such as National Stock Number or Special Item Number. This information shall also be included on the Material Safety Data Sheet submitted under this contract.

Material
(If none, insert None)

Identification No.

_____	_____
_____	_____
_____	_____

(c) This list must be updated during performance of the contract whenever the Contractor determines that any other material to be delivered under this contract is hazardous.

(d) The apparently successful Offeror agrees to submit, for each item as required prior to award, a Material Safety Data Sheet, meeting the requirements of 29 CFR 1910.1200(g) and the latest version of Federal Standard No. 313, for all hazardous material identified in paragraph (b) of this clause. Data shall be submitted in accordance with Federal Standard No. 313, whether or not the apparently successful Offeror is the actual manufacturer of these items. Failure to submit the Material Safety Data Sheet prior to award may result in the apparently successful Offeror being considered nonresponsible and ineligible for award.

(e) If, after award, there is a change in the composition of the item(s) or a revision to Federal Standard No. 313, which renders incomplete or inaccurate the data submitted under paragraph (d) of this clause or the certification submitted under paragraph (c) of this clause, the Contractor shall promptly notify the Contracting Officer and resubmit the data.

(f) Neither the requirements of this clause nor any act or failure to act by the Government shall relieve the Contractor of any responsibility or liability for the safety of Government, Contractor, or subcontractor personnel or property.

(g) Nothing contained in this clause shall relieve the Contractor from complying with applicable Federal, State, and local laws, codes, ordinances, and regulations (including the obtaining of licenses and permits) in connection with hazardous material.

(h) The Government's rights in data furnished under this contract with respect to hazardous material are as follows:

(1) To use, duplicate and disclose any data to which this clause is applicable. The purposes of this right are to--

(i) Apprise personnel of the hazards to which they may be exposed in using, handling, packaging, transporting, or disposing of hazardous materials;

(ii) Obtain medical treatment for those affected by the material; and

(iii) Have others use, duplicate, and disclose the data for the Government for these purposes.

(2) To use, duplicate, and disclose data furnished under this clause, in accordance with subparagraph (h)(1) of this clause, in precedence over any other clause of this contract providing for rights in data.

(3) The Government is not precluded from using similar or data acquired from other sources.

20. FAR 52.223-13

CERTIFICATION OF TOXIC CHEMICAL RELEASE REPORTING (OCT 1996)

(a) Submission of this certification is a prerequisite for making or entering into this contract imposed by Executive Order 12969, August 8, 1995.

(b) By signing this offer, the offeror certifies that--

(1) As the owner or operator of facilities that will be used in for performance of this contract that are subject to the filing and reporting requirements described in section 3123 of the Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA) (42 U.S.C. 11023) and section 6607 of the Pollution Prevention Act of 1990 (PPA) (42 U.S.C. 13106), the offeror will file and continue to file for such facilities for the life of the contract the Toxic Chemical Release Inventory Form (Form R) as described in sections 313(a) and (g) of the EPCRA and section 6607 of PPA; or

(2) None of its owned or operated facilities to be used in the performance of this contract is subject to the Form R filing and reporting requirements because each such facility is exempt for at least one of the following reasons: (Check each block that is applicable.)

() (i) The facility does not manufacture, process, or otherwise use any toxic chemicals listed under section 313(c) of EPCRA, 42 U.S.C. 11023(c);

() (ii) The facility does not have 10 or more full-time employees as specified in section 313(b)(1)(A) of EPCRA, 42 U.S.C. 11023(b)(1)(A);

() (iii) The facility does not meet the reporting thresholds of toxic chemicals established under section 313(f) of EPCRA, 42 U.S.C. 11023(f) (including the alternate thresholds at 40 CFR 372.27, provided an appropriate certification form has been filed with EPA);

() (iv) The facility does not fall within Standard Industrial Classification Code (SIC) designations 20 through 39 as set forth in section 19.102 of the Federal Acquisition Regulation; or

() (v) The facility is not located within any State of the United States, the District of Columbia, the Commonwealth of Puerto Rico, Guam, American Samoa, the United States Virgin Islands, the Northern Mariana Islands, or any other territory or possession over which the United States has jurisdiction.

21. DFARS 252.223-7001

HAZARD WARNING LABELS (DEC 1991)

(a) "Hazardous material," as used in this clause, is defined in the Hazardous Material Identification and Material Safety Data clause of this contract.

(b) The Contractor shall label the item package (unit container) of any hazardous material to be delivered under this contract in accordance with the Hazard Communication Standard (29 CFR 1910.1200 et seq.). The Standard requires that the hazard warning label conform to the requirements of the standard unless the material is otherwise subject to the labeling requirements of one of the following statutes:

(1) Federal Insecticide, Fungicide and Rodenticide Act;

(2) Federal Food, Drug and Cosmetics Act;

- (3) Consumer Product Safety Act;
- (4) Federal Hazardous Substances Act; or
- (5) Federal Alcohol Administration Act.

(c) The Offeror shall list which hazardous material listed in the Hazardous Material Identification and Material Safety Data clause of this contract will be labeled in accordance with one of the Acts in paragraphs (b)(1) through (5) of this clause instead of the Hazard Communication Standard. Any hazardous material not listed will be interpreted to mean that a label is required in accordance with the Hazard Communication Standard.

Material (if none, insert "none.")	Act
_____	_____
_____	_____
_____	_____

(d) The apparently successful Offeror agrees to submit, before award, a copy of the hazard warning label for all hazardous materials not listed in paragraph (c) of this clause. The Offeror shall submit the label with the Material Safety Data Sheet being furnished under the Hazardous Material Identification and Material Safety Data clause of this contract.

(e) The Contractor shall also comply with MIL-STD-129, Marking for Shipment and Storage (including revisions adopted during the term of this contract).

22. 52.225-7006

BUY AMERICAN ACT--TRADE AGREEMENTS--BALANCE OF
PAYMENTS PROGRAM CERTIFICATE (JAN 1994)
(APPLICABLE IF DFARS 252.225-7007 APPLIES - SEE
SECTION 00700)

(a) Definitions.

'Caribbean Basin country end product,' 'designated country end product,' 'domestic end product,' 'NAFTA country end product,' 'nondesignated country end product,' 'qualifying country end product,' and 'U.S. made end product' have the meanings given in the Trade Agreements or Buy American Act and Balance of Payments Program clauses of this solicitation.

(b) Evaluation.

Offers will be evaluated by giving preference to U.S. made end products, qualifying country end products, designated country end products, NAFTA country end products, and Caribbean Basin country end products over other end products.

(c) Certifications.

(1) The Offeror certifies that--

(i) Each end product, except the end products listed in paragraph (c)(2) of this provision, is a domestic end product (as defined in the Buy American Act and Balance of Payments Program clause of this solicitation); and

(ii) Components of unknown origin are considered to have been mined, produced, or manufactured outside the United States or a qualifying country.

(2) The Offeror must identify and certify all end products that are not domestic end products.

(i) The Offeror certifies that the following supplies qualify as 'U.S. made end products' but do not meet the definition of 'domestic end product':

(Insert line item number)

(ii) The Offeror certifies that the following supplies are qualifying country end products:

(Insert line item number)

(Insert country of origin)

(iii) The Offeror certifies that the following supplies qualify as designated country end products:

(Insert line item number)

(Insert country of origin)

(iv) The Offeror certifies that the following supplies qualify as Caribbean Basin country end products:

(Insert line item number)

(Insert country of origin)

(v) The Offeror certifies that the following supplies qualify as NAFTA country end products:

(Insert line item number)

(Insert country of origin)

(vi) The Offeror certifies that the following supplies are other nondesignated country end products:

(Insert line item number)

(Insert country of origin)

23. DFARS 252.225-7035 BUY AMERICAN ACT--NORTH AMERICAN FREE TRADE AGREEMENT IMPLEMENTATION ACT--BALANCE OF PAYMENTS PROGRAM CERTIFICATE (MAY 1995) (APPLICABLE IF DFARS 252.225-7036 APPLIES - SEE SECTION 00700)

(a) Definitions.

"Domestic end product," "qualifying country end product," and "U.S. made end product" have the meanings given in the North American Free Trade Agreement Implementation Act or Buy American Act and Balance of Payments Program clauses of this solicitation.

(b) Evaluation.

Offers will be evaluated by giving preference to U.S. made end products, qualifying country end products, or NAFTA country end products over other end products.

(c) Certifications.

(1) The Offeror certifies that--

(i) Each end product, except the end products listed in paragraph (c)(2) of this provision, is a domestic end product (as defined in the Buy American Act and Balance of Payments Program clause of this solicitation); and

(ii) Components of unknown origin are considered to have been mined, produced, or manufactured outside the United States or a qualifying country.

(2) The Offeror must identify and certify all end products that are not domestic end products.

(i) The Offeror certifies that the following supplies qualify as "U.S. made end products" but do not meet the definition of "domestic end product":

(Insert line item number)

(ii) The Offeror certifies that the following supplies are qualifying country (except Canada) end products:

(Insert line item number)

(Insert country of origin)

(iii) The Offeror certifies that the following supplies qualify as NAFTA country end products:

(Insert Line item number)

(Insert country of origin)

(iv) The Offeror certifies that the following supplies are other non-NAFTA country end products:

(Insert Line item number)

(Insert country of origin)

24. DFARS 252.247-7022

REPRESENTATION OF EXTENT OF TRANSPORTATION BY
SEA (AUG 1992)

(a) The Offeror shall indicate by checking the appropriate blank in paragraph (b) of this provision whether transportation of supplies by sea is anticipated under the resultant contract. The term supplies is defined in the Transportation of Supplies by Sea clause of this solicitation.

(b) Representation.

The Offeror represents that it--

_____ Does anticipate that supplies will be transported by sea in the performance of any contract or subcontract resulting from this solicitation.

_____ Does not anticipate that supplies will be transported by sea in the performance of any contract or subcontract resulting from this solicitation.

(c) Any contract resulting from this solicitation will include the Transportation of Supplies by Sea clause. If the Offeror represents that it will not use ocean transportation, the resulting contract will also include the Defense FAR Supplement clause at 252.247-7024, Notification of Transportation of Supplies by Sea.

END OF SECTION

SECTION 00700
CONSTRUCTION CONTRACT CLAUSES

SECTION 00700

CONTRACT CLAUSES

1. FAR 52.252-2 CLAUSES INCORPORATED BY REFERENCE (JUN 1988)

This solicitation incorporates one or more clauses by reference, with the same force and effect as if they were given in full text. Upon request, the Contracting Officer will make their full text available.

CONTRACT CLAUSES BY REFERENCE:

- | | | |
|-----|--------------------|------------------------------------------------------------------------------------------------------------------------------------|
| 2. | DFARS 252.201-7000 | CONTRACTING OFFICER'S REPRESENTATIVE (DEC 1991) |
| 3. | FAR 52.202-1 I | DEFINITIONS (OCT 1995)--ALTERNATE I (APR 1984) |
| 4. | FAR 52.203-3 | GRATUITIES (APR 1984) |
| 5. | FAR 52.203-5 | COVENANT AGAINST CONTINGENT FEES (APR 1984) |
| 6. | FAR 52.203-6 | RESTRICTIONS ON SUBCONTRACTOR SALES TO THE GOVERNMENT (JUL 1995) |
| 7. | FAR 52.203-7 | ANTI-KICKBACK PROCEDURES (JUL 1995) |
| 8. | FAR 52.203-10 | PRICE OR FEE ADJUSTMENT FOR ILLEGAL OR IMPROPER ACTIVITY (JAN 1997) |
| 9. | FAR 52.203-12 | LIMITATION ON PAYMENTS TO INFLUENCE CERTAIN FEDERAL TRANSACTIONS (JAN 1990)
(APPLICABLE OVER \$100,000) |
| 10. | DFARS 252.203-7000 | STATUTORY PROHIBITION ON COMPENSATION TO FORMER DEPARTMENT OF DEFENSE EMPLOYEES (NOV 1995)
(APPLICABLE OVER \$100,000) |
| 11. | DFARS 252.203-7001 | SPECIAL PROHIBITION ON EMPLOYMENT (NOV 1995) |
| 12. | DFARS 252.203-7002 | DISPLAY OF DOD HOTLINE POSTER (DEC 1991)
(APPLICABLE OVER \$5 MILLION) |
| 13. | FAR 52.204-2 II | SECURITY REQUIREMENTS (APR 1984)--ALTERNATE II (APR 1984)
(APPLICABLE IF CONTRACTOR HAS ACCESS TO CLASSIFIED INFORMATION) |
| 14. | DFARS 252.204-7000 | DISCLOSURE OF INFORMATION (DEC 1991)
(APPLICABLE IF CONTRACTOR HAS ACCESS TO INFORMATION INAPPROPRIATE FOR RELEASE) |
| 15. | DFARS 252.205-7000 | PROVISION OF INFORMATION TO COOPERATIVE AGREEMENT HOLDERS (DEC 1991)
(APPLICABLE OVER \$500,000) |
| 16. | FAR 52.209-6 | PROTECTING THE GOVERNMENT'S INTEREST WHEN SUBCONTRACTING WITH CONTRACTORS DEBARRED, SUSPENDED OR PROPOSED FOR DEBARMENT (JUL 1995) |
| 17. | DFARS 252.209-7000 | ACQUISITION FROM SUBCONTRACTORS SUBJECT TO ON-SITE INSPECTION UNDER THE INTERMEDIATE-RANGE NUCLEAR FORCES (INF) TREATY (NOV 1995) |

18. DFARS 252.209-7004 REPORTING OF COMMERCIAL TRANSACTIONS WITH THE
GOVERNMENT OF A TERRORIST COUNTRY (SEP 1994)
(APPLICABLE OVER \$5,000,000)
19. FAR 52.211-15 DEFENSE PRIORITY AND ALLOCATION REQUIREMENTS
(SEP 1990)
20. FAR 52.211-18 VARIATION IN ESTIMATED QUANTITY (APR 1984)
(APPLICABLE IF THERE ARE ESTIMATED-QUANTITY LINE
ITEMS IN PRICING SCHEDULE)
21. FAR 52.214-26 AUDIT AND RECORDS--SEALED BIDDING (OCT 1995)
(APPLICABLE IF SEALED BIDDING - SEE BLOCK 2,
SF1442 - AND OVER \$500,000)
22. FAR 52.214-27 PRICE REDUCTION FOR DEFECTIVE COST OR PRICING
DATA-MODIFICATIONS-SEALED BIDDING (OCT 1995)
(APPLICABLE IF SEALED BIDDING - SEE BLOCK 2,
SF1442 - AND OVER \$500,000)
23. FAR 52.214-28 SUBCONTRACTOR COST OR PRICING DATA--
MODIFICATIONS--SEALED BIDDING (OCT 1995)
(APPLICABLE IF SEALED BIDDING - SEE BLOCK 2,
SF1442 - AND OVER \$500,000)
24. FAR 52.214-29 ORDER OR PRECEDENCE--SEALED BIDDING (JAN 1986)
(APPLICABLE IF SEALED BIDDING - SEE BLOCK 2,
SF1442)
25. FAR 52.215-2 AUDIT AND RECORDS--NEGOTIATION (AUG 1996)
(APPLICABLE IF CONTRACTING BY NEGOTIATIONS)
26. FAR 52.215-22 PRICE REDUCTION FOR DEFECTIVE COST OR PRICING
DATA (OCT 1995)
(APPLICABLE IF CONTRACTING BY NEGOTIATIONS AND
CERTIFIED COST OR PRICING DATA IS REQUIRED)
27. FAR 52.215-24 SUBCONTRACTOR COST OR PRICING DATA (OCT 1995)
(APPLICABLE FAR 52.215-22 APPLIES)
28. FAR 52.215-27 TERMINATION OF DEFINED BENEFIT PENSION PLANS
(MAR 1996)
(APPLICABLE IF CERTIFIED COST OR PRICING DATA IS
REQUIRED AND FOR WHICH ANY PREAWARD OR POSTAWARD
COST DETERMINATIONS WILL BE SUBJECT TO FAR
SUBPART 31.2)
29. FAR 52.215-31 WAIVER OF FACILITIES CAPITAL COST OF MONEY (SEP
1987)
(APPLICABLE ANY TIME THE COST PRINCIPLES OF FAR
31.2 APPLY - MODIFICATIONS - AND ORIGINAL
BID/OFFER DID NOT INCLUDE FACILITIES CAPITAL
COST OF MONEY)
30. FAR 52.215-33 ORDER OF PRECEDENCE (JAN 1986)
(APPLICABLE IF NEGOTIATED - SEE BLOCK 2, SF
1442)

- 31. FAR 52.215-39 REVERSION OR ADJUSTMENT OF PLANS FOR POSTRETIREMENT BENEFITS (PRB) OTHER THAN PENSIONS (MAR 1996)
(APPLICABLE IF CERTIFIED COST OR PRICING DATA WILL BE REQUIRED OR FOR WHICH ANY PREAWARD OR POSTAWARD COST DETERMINATIONS WILL BE SUBJECT TO FAR SUBPART 31.2)
- 32. FAR 52.215-40 NOTIFICATION OF OWNERSHIP CHANGES (FEB 1995)
(APPLICABLE IF CERTIFIED COST OR PRICING DATA WILL BE REQUIRED OR FOR WHICH ANY PREAWARD OR POSTAWARD COST DETERMINATIONS WILL BE SUBJECT TO FAR SUBPART 31.2)
- 33. DFARS 252.215-7000 PRICING ADJUSTMENTS (DEC 1991)
(APPLICABLE IF FAR 52.215-24 APPLIES)
- 34. DFARS 252.215-7002 COST ESTIMATING SYSTEM REQUIREMENTS (DEC 1991)
(APPLICABLE IF NEGOTIATED - SEE BLOCK 2, SF 1442 - AND CONTRACT AWARD IS MADE ON THE BASIS OF CERTIFIED COST OR PRICING DATA)
- 35. FAR 52.219-6 NOTICE OF TOTAL SMALL BUSINESS SET-ASIDE (JUL 1996)
(APPLICABLE IF SET ASIDE FOR SMALL BUSINESS - SEE DD FORM 1707)
- 36. FAR 52.219-8 UTILIZATION OF SMALL, SMALL DISADVANTAGED AND WOMEN-OWNED SMALL BUSINESS CONCERNS (OCT 1995)
- 37. FAR 52.219-16 LIQUIDATED DAMAGES--SUBCONTRACTING PLAN (OCT 1995)
(APPLICABLE IF FAR 52.219-9 IS APPLICABLE)
- 38. DFARS 252.219-7003 SMALL, SMALL DISADVANTAGED AND WOMEN-OWNED SMALL BUSINESS SUBCONTRACTING PLAN (DOD CONTRACTS) (APR 1996)
(APPLICABLE IF FAR 52.219-9 IS APPLICABLE)
- 39. FAR 52.222-3 CONVICT LABOR (AUG 1996)
- 40. FAR 52.222-4 CONTRACT WORK HOURS AND SAFETY STANDARDS ACT-OVERTIME COMPENSATION (JUL 1995)
- 41. FAR 52.222-6 DAVIS-BACON ACT (FEB 1995)
- 42. FAR 52.222-7 WITHHOLDING OF FUNDS (FEB 1988)
- 43. FAR 52.222-8 PAYROLLS AND BASIC RECORDS (FEB 1988)
- 44. FAR 52.222-9 APPRENTICES AND TRAINEES (FEB 1988)
- 45. FAR 52.222-10 COMPLIANCE WITH COPELAND ACT REQUIREMENTS (FEB 1988)
- 46. FAR 52.222-11 SUBCONTRACTS (LABOR STANDARDS) (FEB 1988)
- 47. FAR 52.222-12 CONTRACT TERMINATION--DEBARMENT (FEB 1988)
- 48. FAR 52.222-13 COMPLIANCE WITH DAVIS-BACON AND RELATED ACT REGULATIONS (FEB 1988)

- 49. FAR 52.222-14 DISPUTES CONCERNING LABOR STANDARDS (FEB 1988)
- 50. FAR 52.222-15 CERTIFICATION OF ELIGIBILITY (FEB 1988)
- 51. FAR 52.222-26 EQUAL OPPORTUNITY (APR 1984)
- 52. FAR 52.222-27 AFFIRMATIVE ACTION COMPLIANCE REQUIREMENTS FOR CONSTRUCTION (APR 1984)
- 53. FAR 52.222-35 AFFIRMATIVE ACTION FOR SPECIAL DISABLED AND VIETNAM ERA VETERANS (APR 1984)
- 54. FAR 52.222-36 AFFIRMATIVE ACTION FOR HANDICAPPED WORKERS (APR 1984)
- 55. FAR 52.222-37 EMPLOYMENT REPORTS ON SPECIAL DISABLED VETERANS AND VETERANS OF THE VIETNAM ERA (JAN 1988)
- 56. FAR 52.223-2 CLEAN AIR AND WATER (APR 1984)
(APPLICABLE OVER \$100,000 AND THE ANSWER TO SECTION 00600, 52.223-1, IS YES)
- 57. FAR 52.223-6 DRUG-FREE WORKPLACE (JAN 1997)
- 58. DFARS 252.223-7002 SAFETY PRECAUTIONS FOR AMMUNITION AND EXPLOSIVES (MAY 1994)
(APPLICABLE IF EXPLOSIVES ARE USED)
- 59. DFARS 252.223-7003 CHANGE IN PLACE OF PERFORMANCE--AMMUNITION AND EXPLOSIVES (DEC 1991)
(APPLICABLE IF EXPLOSIVES ARE USED)
- 60. FAR 52.225-11 RESTRICTIONS ON CERTAIN FOREIGN PURCHASES (OCT 1996)
- 61. DFARS 252.225-7007 TRADE AGREEMENTS ACT (JAN 1996)
(APPLICABLE IF CONTRACT AMOUNT IS \$182,000 OR OVER EXCEPT WHEN SMALL OR SMALL, DISADVANTAGED BUSINESS PREFERENCE PROGRAM APPLIES TO THIS ACQUISITION)
- 62. DFARS 252.225-7008 SUPPLIES TO BE ACCORDED DUTY-FREE ENTRY (DEC 1991)
- 63. DFARS 252.225-7009 DUTY-FREE ENTRY--QUALIFYING COUNTRY END PRODUCTS AND SUPPLIES (DEC 1991)
- 64. DFARS 252.225-7012 PREFERENCE FOR CERTAIN DOMESTIC COMMODITIES (NOV 1995)
- 65. DFARS 252.225-7026 REPORTING OF CONTRACT PERFORMANCE OUTSIDE THE UNITED STATES (NOV 1995)
(APPLICABLE OVER \$500,000)
- 66. DFARS 252.225-7036 NORTH AMERICAN FREE TRADE AGREEMENT IMPLEMENTATION ACT (JAN 1994)
(APPLICABLE IF CONTRACT AMOUNT IS \$6,500,000 OR OVER EXCEPT WHEN SMALL OR SMALL, DISADVANTAGED BUSINESS PREFERENCE PROGRAM APPLIES TO THIS ACQUISITION)
- 67. DFARS 252.225-7037 DUTY-FREE ENTRY--NAFTA COUNTRY END PRODUCTS AND SUPPLIES (JAN 1994)

- (APPLICABLE IF DFARS 252.225-7036 APPLIES - SEE ABOVE)
- 68. FAR 52.226-1 UTILIZATION OF INDIAN ORGANIZATIONS AND INDIAN-OWNED ECONOMIC ENTERPRISES (SEP 1996)
(APPLICABLE IF FAR 52.219-9 IS APPLICABLE)
 - 69. FAR 52.227-1 AUTHORIZATION AND CONSENT (JUL 1995)
 - 70. FAR 52.227-4 PATENT INDEMNITY--CONSTRUCTION CONTRACTS (APR 1984)
 - 71. FAR 52.227-11 PATENT RIGHTS--RETENTION BY THE CONTRACTOR (SHORT FORM) (JUN 1989)
(APPLICABLE IF NONSTANDARD WORK AND SMALL BUSINESS - SEE FAR 27.304-3)
 - 72. FAR 52.227-12 PATENT RIGHTS--RETENTION BY THE CONTRACTOR (LONG FORM) (JAN 1997)
(APPLICABLE IF NONSTANDARD WORK AND LARGE BUSINESS - SEE FAR 27.304-3)
 - 73. DFARS 252.227-7000 NON-ESTOPPEL (OCT 1966)
 - 74. DFARS 252.227-7022 GOVERNMENT RIGHTS (UNLIMITED) (MAR 1979)
(APPLICABLE TO CONSTRUCTION INVOLVING DESIGN SERVICES)
 - 75. DFARS 252.227-7023 DRAWINGS AND OTHER DATA TO BECOME PROPERTY OF GOVERNMENT (MAR 1979)
(APPLICABLE TO CONSTRUCTION INVOLVING DESIGN SERVICES)
 - 76. DFARS 252.227-7024 NOTICE AND APPROVAL OF RESTRICTED DESIGNS (APR 1984)
(APPLICABLE TO CONSTRUCTION INVOLVING DESIGN SERVICES)
 - 77. DFARS 252.227-7033 RIGHTS IN SHOP DRAWINGS (APR 1966)
 - 78. DFARS 252.227-7034 PATENTS--SUBCONTRACTS (APR 1984)
 - 79. DFARS 252.227-7039 PATENTS--REPORTING OF SUBJECT INVENTIONS (APR 1990)
(APPLICABLE IF FAR 52.227-11 ABOVE IS APPLICABLE)
 - 80. FAR 52.228-1 BID GUARANTEE (SEP 1996)
 - 81. FAR 52.228-2 ADDITIONAL BOND SECURITY (APR 1984)
 - 82. FAR 52.228-11 PLEDGES OF ASSETS (FEB 1992)
 - 83. FAR 52.229-3 FEDERAL, STATE, AND LOCAL TAXES (JAN 1991)
 - 84. FAR 52.229-5 TAXES--CONTRACTS PERFORMED IN U.S. POSSESSIONS OR PUERTO RICO (APR 1984)
 - 85. DFARS 252.231-7000 SUPPLEMENTAL COST PRINCIPLES (DEC 1991)
 - 86. FAR 52.232-5 PAYMENTS UNDER FIXED-PRICE CONSTRUCTION CONTRACTS (MAY 1997)

87.	FAR 52.232-17	INTEREST (JUN 1996)
88.	FAR 52.232-23 I	ASSIGNMENT OF CLAIMS (JAN 1986)--ALTERNATE I (APR 1984)
89.	FAR 52.233-1	DISPUTES (OCT 1995)
90.	FAR 52.233-3	PROTEST AFTER AWARD (OCT 1995)
91.	DFARS 252.233-7000	CERTIFICATION OF CLAIMS AND REQUESTS FOR ADJUSTMENT OR RELIEF (MAY 1994) (APPLICABLE OVER \$100,000)
92.	FAR 52.236-2	DIFFERING SITE CONDITIONS (APR 1984)
93.	FAR 52.236-3	SITE INVESTIGATION AND CONDITIONS AFFECTING THE WORK (APR 1984)
94.	FAR 52.236-5	MATERIALS AND WORKMANSHIP (APR 1984)
95.	FAR 52.236-6	SUPERINTENDENCE BY THE CONTRACTOR (APR 1984)
96.	FAR 52.236-7	PERMITS AND RESPONSIBILITIES (NOV 1991)
97.	FAR 52.236-8	OTHER CONTRACTS (APR 1984)
98.	FAR 52.236-9	PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES, AND IMPROVEMENTS (APR 1984)
99.	FAR 52.236-10	OPERATIONS AND STORAGE AREAS (APR 1984)
100.	FAR 52.236-11	USE AND POSSESSION PRIOR TO COMPLETION (APR 1984)
101.	FAR 52.236-12	CLEANING UP (APR 1984)
102.	FAR 52.236-13 I	ACCIDENT PREVENTION (NOV 1991)--ALTERNATE I (NOV 1991)
103.	FAR 52.236-15	SCHEDULES FOR CONSTRUCTION CONTRACTS (APR 1984) (APPLICABLE IF PERFORMANCE PERIOD EXCEEDS 60 DAYS)
104.	FAR 52.236-17	LAYOUT OF WORK (APR 1984)
105.	FAR 52.236-21 I	SPECIFICATIONS AND DRAWINGS FOR CONSTRUCTION (FEB 1997)--ALTERNATE I (APR 1984)
106.	DFARS 252.236-7000	MODIFICATION PROPOSALS--PRICE BREAKDOWN (DEC 1991)
107.	DFARS 252.236-7008	CONTRACT PRICES-BIDDING SCHEDULES (DEC 1991) (APPLICABLE IF THERE ARE UNIT PRICES)
108.	FAR 52.242-13	BANKRUPTCY (JUL 1995)
109.	FAR 52.242-14	SUSPENSION OF WORK (APR 1984)
110.	DFARS 252.242-7000	POSTAWARD CONFERENCE (DEC 1991)
111.	FAR 52.243-4	CHANGES (AUG 1987)

112. DFARS 252.243-7001

PRICING OF CONTRACT MODIFICATIONS (DEC 1991)

113. FAR 52.244-1

SUBCONTRACTS (FIXED-PRICE CONTRACTS) (FEB 1995)
(APPLICABLE OVER \$500,000)

- 114. FAR 52.245-1 PROPERTY RECORDS (APR 1984)
(APPLICABLE IF GOVERNMENT-FURNISHED PROPERTY
(GFP) IS INVOLVED AND THE GOVERNMENT WILL
MAINTAIN OFFICIAL PROPERTY RECORDS-IF THERE IS
ANY GFP SECTION 00800 WILL CONTAIN A LIST OF THE
GFP)
- 115. FAR 52.245-2 GOVERNMENT PROPERTY (FIXED-PRICE CONTRACTS (DEC
1989)
(APPLICABLE IF GOVERNMENT-FURNISHED PROPERTY IS
INVOLVED WORTH OVER \$100,000-SEE SECTION 00800)
- 116. FAR 52.245-4 GOVERNMENT-FURNISHED PROPERTY (SHORT FORM) (APR
1984)
(APPLICABLE IF GOVERNMENT-FURNISHED PROPERTY IS
INVOLVED WORTH \$100,000 OR LESS - SEE SECTION
00800)
- 117. DFARS 252.245-7001 REPORTS OF GOVERNMENT PROPERTY (MAY 1994)
(APPLICABLE IF FAR 52.245-2 IS APPLICABLE)
- 118. FAR 52.246-21 WARRANTY OF CONSTRUCTION (MAR 1994)
(NOT APPLICABLE TO CONTRACTS SOLELY FOR
DREDGING, EXCAVATION, GRUBBING OR CLEARING;
EFARS 46.710)
- 119. DFARS 252.247-7024 NOTIFICATION OF TRANSPORTATION OF SUPPLIES BY
SEA (NOV 1995)
(APPLICABLE IF THE ANSWER TO SECTION 00600,
DFARS 52.247-7002, IS NEGATIVE)
- 120. FAR 52.248-3 VALUE ENGINEERING--CONSTRUCTION (MAR 1989)
(APPLICABLE OVER \$100,000)
- 121. FAR 52.249-1 TERMINATION FOR CONVENIENCE OF THE GOVERNMENT
(FIXED-PRICE) (SHORT FORM) (APR 1984)
(APPLICABLE \$100,000 OR LESS)
- 122. FAR 52.249-2 I TERMINATION FOR CONVENIENCE OF THE GOVERNMENT
(FIXED-PRICE) (SEP 1996)--ALTERNATE I (SEP 1996)
(APPLICABLE OVER \$100,000)
- 123. FAR 52.249-10 DEFAULT (FIXED-PRICE CONSTRUCTION) (APR 1984)
- 124. DFARS 252.249-7001 NOTIFICATION OF SUBSTANTIAL IMPACT ON EMPLOYMENT
(DEC 1991)
(APPLICABLE IF CONTRACT IS OVER \$5 MILLION WITH
SUBCONTRACTS OVER \$500,000)
- 125. FAR 52.253-1 COMPUTER-GENERATED FORMS (JAN 1991)

THE FOLLOWING CONTRACT CLAUSES ARE INCLUDED IN FULL TEXT

- 126. FAR 52.219-9 SMALL, SMALL DISADVANTAGED AND WOMEN-OWNED SMALL BUSINESS SUBCONTRACTING PLAN (AUG 1996)
(APPLICABLE IF NEGOTIATED - SEE BLOCK 2, SF 1442 - AND OVER \$1 MILLION; REQUIRED FROM LARGE BUSINESSES ONLY) (SEE ATTACHMENT SECTION)
- 127. FAR 52.219-9 I SMALL, SMALL DISADVANTAGED AND WOMEN-OWNED SMALL BUSINESS SUBCONTRACTING PLAN (AUG 1996)--
ALTERNATE I (OCT 1995)
(APPLICABLE IF SEALED BIDDING - SEE BLOCK 2, SF1442 - OVER \$1 MILLION; REQUIRED FROM LARGE BUSINESSES ONLY) (SEE ATTACHMENT SECTION)
- 128. FAR 52.223-7 NOTICE OF RADIOACTIVE MATERIALS (NOV 1991)
(APPLICABLE IF RADIOACTIVE MATERIALS ARE INVOLVED)
- 129. FAR 52.225-5 BUY AMERICAN ACT--CONSTRUCTION MATERIALS (MAY 1997)
(APPLICABLE IF FAR 52.225-15, DFARS 252.225-7007, OR DFARS 252.225-7036 ARE NOT APPLICABLE - SEE BELOW)
- 130. FAR 52.225-15 BUY AMERICAN ACT--CONSTRUCTION MATERIALS UNDER TRADE AGREEMENTS ACT AND NORTH AMERICAN FREE TRADE AGREEMENT (MAY 1997)
(APPLICABLE IF CONTRACT AMOUNT IS \$7,311,000 OR OVER EXCEPT WHEN SMALL OR SMALL, DISADVANTAGED BUSINESS PREFERENCE PROGRAM APPLIES TO THIS ACQUISITION)
- 131. FAR 52.225-15 I BUY AMERICAN ACT--CONSTRUCTION MATERIALS UNDER TRADE AGREEMENTS ACT AND NORTH AMERICAN FREE TRADE AGREEMENT (MAY 1997)--ALTERNATE I (MAY 1997)
(APPLICABLE IF CONTRACT AMOUNT IS FROM \$6,500,000 TO \$7,311,000 EXCEPT WHEN SMALL OR SMALL, DISADVANTAGED BUSINESS PREFERENCE PROGRAM APPLIES TO THIS ACQUISITION)
- 132. DFARS 252.225-7031 SECONDARY ARAB BOYCOTT OF ISRAEL (JUN 1992)
- 133. SAACONS 52.0236-4820 ORDER OF PRECEDENCE (JAN 1993)
- 134. FAR 52.243-7 NOTIFICATION OF CHANGES (APR 1984)
- 135. DFARS 252.247-7023 TRANSPORTATION OF SUPPLIES BY SEA (NOV 1995)
- 136. FAR 52.252-4 ALTERATIONS IN CONTRACT (APR 1984)
- 137. FAR 52.252-6 AUTHORIZED DEVIATIONS IN CLAUSES (APR 1984)
- 138. DFARS 252.223-7004 DRUG-FREE WORK FORCE (SEP 1988)
- 139. EFARS 52.249-5000 BASIS FOR SETTLEMENT OF PROPOSALS (DEC 1995)

CONTRACT CLAUSES IN FULL TEXT

126. FAR 52.219-9

SMALL, SMALL DISADVANTAGED AND WOMEN-OWNED SMALL
BUSINESS SUBCONTRACTING PLAN (AUG 1996)
(APPLICABLE IF NEGOTIATED - SEE BLOCK 2, SF 1442
- AND OVER \$1 MILLION; REQUIRED FROM LARGE
BUSINESSES ONLY; SEE ATTACHMENTS SECTION)

(a) This clause does not apply to small business concerns.

(b) "Commercial product," as used in this clause, means a product in regular production that is sold in substantial quantities to the general public and/or industry at established catalog or market prices. It also means a product which, in the opinion of the Contracting Officer, differs only insignificantly from the Contractor's commercial product.

"Subcontract," as used in this clause, means any agreement (other than one involving an employer-employee relationship) entered into by a Federal Government prime Contractor or subcontractor calling for supplies or services required for performance of the contract or subcontract.

(c) The offeror, upon request by the Contracting Officer, shall submit and negotiate a subcontracting plan, where applicable, which separately addresses subcontracting with small business concerns, with small disadvantaged business concerns and with women-owned small business concerns. If the offeror is submitting an individual contract plan, the plan must separately address subcontracting with small business concerns, small disadvantaged business concerns, and women-owned small business concerns with a separate part for the basic contract and separate parts for each option (if any). The plan shall be included in and made a part of the resultant contract. The subcontracting plan shall be negotiated within the time specified by the Contracting Officer. Failure to submit and negotiate the subcontracting plan shall make the offeror ineligible for award of a contract.

(d) The offeror's subcontracting plan shall include the following:

(1) Goals, expressed in terms of percentages of total planned subcontracting dollars, for the use of small business concerns, small disadvantaged business concerns and women-owned small business concerns as subcontractors. The offeror shall include all subcontracts that contribute to contract performance, and may include a proportionate share of products and services that are normally allocated as indirect costs.

(2) A statement of--

(i) Total dollars planned to be subcontracted;

(ii) Total dollars planned to be subcontracted to small business concerns; and

(iii) Total dollars planned to be subcontracted to small disadvantaged business concerns; and

(iv) Total dollars planned to be subcontracted to women-owned small business concerns.

(3) A description of the principal types of supplies and services to be subcontracted, and an identification of the types planned for subcontracting to (i) small business concerns, (ii) small disadvantaged business concerns and (iii) women-owned small business concerns.

(4) A description of the method used to develop the subcontracting goals in paragraph (d)(1) of this clause.

(5) A description of the method used to identify potential sources for solicitation purposes (e.g., existing company source lists, the Procurement Automated Source System (PASS) of the Small Business Administration, the National Minority Purchasing Council Vendor Information Service, the Research and Information Division of the Minority Business Development Agency in the Department of Commerce, or small, small disadvantaged and women-owned small business concerns trade associations). A firm may rely on the information contained in PASS as an accurate representation of a concern's size and ownership characteristics for purposes of maintaining a small business source list. A firm may rely on PASS as its small business source list. Use of the PASS as its source list does not relieve a firm of its responsibilities (i.e.,

outreach, assistance, counseling, publicizing subcontracting opportunities) in this clause.

(6) A statement as to whether or not the offeror included indirect costs in establishing subcontracting goals, and a description of the method used to determine the proportionate share of indirect costs to be incurred with (i) small business concerns, (ii) small disadvantaged business concerns, and (iii) women-owned small business concerns.

(7) The name of the individual employed by the offeror who will administer the offeror's subcontracting program, and a description of the duties of the individual.

(8) A description of the efforts the offeror will make to assure that small, small disadvantaged and women-owned small business concerns have an equitable opportunity to compete for subcontracts.

(9) Assurances that the offeror will include the clause in this contract entitled "Utilization of Small, Small Disadvantaged and Women-Owned Small Business Concerns" in all subcontracts that offer further subcontracting opportunities, and that the offeror will require all subcontractors (except small business concerns) who receive subcontracts in excess of \$500,000 (\$1,000,000 for construction of any public facility) to adopt a plan similar to the plan agreed to by the offeror.

(10) Assurances that the offeror will (i) cooperate in any studies or surveys as may be required, (ii) submit periodic reports in order to allow the Government to determine the extent of compliance by the offeror with the subcontracting plan, (iii) submit Standard Form (SF) 294, Subcontracting Report for Individual Contracts, and/or SF 295, Summary Subcontract Report, in accordance with the instructions on the forms, and (iv) ensure that its subcontractors agree to submit Standard Forms 294 and 295.

(11) A recitation of the types of records the offeror will maintain to demonstrate procedures that have been adopted to comply with the requirements and goals in the plan, including establishing source lists; and a description of its efforts to locate small, small disadvantaged and women-owned small business concerns and award subcontracts to them. The records shall include at least the following (on a plant-wide or company-wide basis, unless otherwise indicated):

(i) Source lists (e.g., PASS), guides, and other data that identify small, small disadvantaged and women-owned small business concerns.

(ii) Organizations contacted in an attempt to locate sources that are small, small disadvantaged or women-owned small business concerns.

(iii) Records on each subcontract solicitation resulting in an award of more than \$100,000, indicating (A) whether small business concerns were solicited and if not, why not, (B) whether small disadvantaged business concerns were solicited and if not, why not, (C) whether women-owned small business concerns were solicited and if not, why not, and (D) if applicable, the reason award was not made to a small business concern.

(iv) Records of any outreach efforts to contact (A) trade associations, (B) business development organizations, and (C) conferences and trade fairs to locate small, small disadvantaged and women-owned small business sources.

(v) Records of internal guidance and encouragement provided to buyers through (A) workshops, seminars, training, etc., and (B) monitoring performance to evaluate compliance with the programs's requirements.

(vi) On a contract-by-contract basis, records to support award data submitted by the offeror to the Government, including the name, address, and business size of each subcontractor. Contractors having company or division-wide annual plans need not comply with this requirement.

(e) In order to effectively implement this plan to the extent consistent with efficient contract performance, the Contractor shall perform the following functions:

(1) Assist small, small disadvantaged and women-owned small business concerns by arranging solicitations, time for the preparation of bids, quantities, specifications, and delivery schedules so as to facilitate the participation by such concerns. Where the contractor's lists of potential small, small disadvantaged and women-owned small business subcontractors are

excessively long, reasonable effort shall be made to give all such small business concerns an opportunity to compete over a period of time.

(2) Provide adequate and timely consideration of the potentialities of small, small disadvantaged and women-owned small business concerns in all "make-or-buy" decisions.

(3) Counsel and discuss subcontracting opportunities with representatives of small, small disadvantaged and women-owned small business firms.

(4) Provide notice to subcontractors concerning penalties and remedies for misrepresentations of business status as small, small disadvantaged or women-owned small business for the purpose of obtaining a subcontract that is to be included as part or all of a goal contained in the Contractor's subcontracting plan.

(f) A master subcontracting plan on a plant or division-wide basis which contains all the elements required by (d) of this clause, except goals, may be incorporated by reference as a part of the subcontracting plan required of the offeror by this clause; provided, (1) the master plan has been approved, (2) the offeror ensures that the plan is updated as necessary and provides copies of the approved master plan, including evidence of its approval, to the Contracting Officer, and (3) goals and any deviations from the master plan deemed necessary by the Contracting Officer to satisfy the requirements of this contract are set forth in the individual subcontracting plan.

(g)(1) If a commercial product is offered, the subcontracting plan required by this clause may relate to the offeror's production generally, for both commercial and noncommercial products, rather than solely to the Government contract. In these cases, the offeror shall, with the concurrence of the Contracting Officer, submit one company-wide or division-wide annual plan.

(2) The annual plan shall be reviewed for approval by the agency awarding the offeror its first prime contract requiring a subcontracting plan during the fiscal year, or by an agency satisfactory to the Contracting Officer.

(3) The approved plan shall remain in effect during the offeror's fiscal year for all of the offeror's commercial products.

(h) Prior compliance of the offeror with other such subcontracting plans under previous contracts will be considered by the Contracting Officer in determining the responsibility of the offeror for award of the contract.

(i) The failure of the Contractor or subcontractor to comply in good faith with (1) the clause of this contract entitled "Utilization of Small, Small Disadvantaged and Women-Owned Small Business Concerns," or (2) an approved plan required by this clause, shall be a material breach of the contract.

127. FAR 52.219-9 I

SMALL, SMALL DISADVANTAGED AND WOMEN-OWNED SMALL BUSINESS SUBCONTRACTING PLAN (AUG 1996)--ALTERNATE I (OCT 1995)
(APPLICABLE IF SEALED BIDDING - SEE BLOCK 2, SF 1442 - AND OVER \$1 MILLION; REQUIRED FROM LARGE BUSINESSES ONLY; SEE ATTACHMENTS SECTION)

(a) This clause does not apply to small business concerns.

(b) "Commercial product," as used in this clause, means a product in regular production that is sold in substantial quantities to the general public and/or industry at established catalog or market prices. It also means a product which, in the opinion of the Contracting Officer, differs only insignificantly from the Contractor's commercial product.

"Subcontract," as used in this clause, means any agreement (other than one involving an employer-employee relationship) entered into by a Federal Government prime Contractor or subcontractor calling for supplies or services required for performance of the contract or subcontract.

(c) The apparent low bidder, upon request by the Contracting Officer, shall submit a subcontracting plan, where applicable, which separately addresses subcontracting with small business concerns, with small disadvantaged business concerns and with women-owned small business concerns. If the bidder is submitting an individual contract plan, the plan must

separately address subcontracting with small business concerns, small disadvantaged business concerns, and women-owned small business concerns with a separate part for the basic contract and separate parts for each option (if any). The plan shall be included in and made a part of the resultant contract. The subcontracting plan shall be submitted within the time specified by the Contracting Officer. Failure to submit the subcontracting plan shall make the bidder ineligible for the award of a contract.

(d) The offeror's subcontracting plan shall include the following:

(1) Goals, expressed in terms of percentages of total planned subcontracting dollars, for the use of small business concerns, small disadvantaged business concerns and women-owned small business concerns as subcontractors. The offeror shall include all subcontracts that contribute to contract performance, and may include a proportionate share of products and services that are normally allocated as indirect costs.

(2) A statement of--

(i) Total dollars planned to be subcontracted;

(ii) Total dollars planned to be subcontracted to small business concerns; and

(iii) Total dollars planned to be subcontracted to small disadvantaged business concerns; and

(iv) Total dollars planned to be subcontracted to women-owned small business concerns.

(3) A description of the principal types of supplies and services to be subcontracted, and an identification of the types planned for subcontracting to (i) small business concerns, (ii) small disadvantaged business concerns and (iii) women-owned small business concerns.

(4) A description of the method used to develop the subcontracting goals in paragraph (d)(1) of this clause.

(5) A description of the method used to identify potential sources for solicitation purposes (e.g., existing company source lists, the Procurement Automated Source System (PASS) of the Small Business Administration, the National Minority Purchasing Council Vendor Information Service, the Research and Information Division of the Minority Business Development Agency in the Department of Commerce, or small, small disadvantaged and women-owned small business concerns trade associations). A firm may rely on the information contained in PASS as an accurate representation of a concern's size and ownership characteristics for purposes of maintaining a small business source list. A firm may rely on PASS as its small business source list. Use of the PASS as its source list does not relieve a firm of its responsibilities (i.e., outreach, assistance, counseling, publicizing subcontracting opportunities) in this clause.

(6) A statement as to whether or not the offeror included indirect costs in establishing subcontracting goals, and a description of the method used to determine the proportionate share of indirect costs to be incurred with (i) small business concerns, (ii) small disadvantaged business concerns, and (iii) women-owned small business concerns.

(7) The name of the individual employed by the offeror who will administer the offeror's subcontracting program, and a description of the duties of the individual.

(8) A description of the efforts the offeror will make to assure that small, small disadvantaged and women-owned small business concerns have an equitable opportunity to compete for subcontracts.

(9) Assurances that the offeror will include the clause in this contract entitled "Utilization of Small, Small Disadvantaged and Women-Owned Small Business Concerns" in all subcontracts that offer further subcontracting opportunities, and that the offeror will require all subcontractors (except small business concerns) who receive subcontracts in excess of \$500,000 (\$1,000,000 for construction of any public facility) to adopt a plan similar to the plan agreed to by the offeror.

(10) Assurances that the offeror will (i) cooperate in any studies or surveys as may be required, (ii) submit periodic reports in order to allow the Government to determine the extent of compliance by the offeror with the subcontracting plan, (iii) submit Standard Form (SF) 294, Subcontracting

Report for Individual Contracts, and/or SF 295, Summary Subcontract Report, in accordance with the instructions on the forms, and (iv) ensure that its subcontractors agree to submit Standard Forms 294 and 295.

(11) A recitation of the types of records the offeror will maintain to demonstrate procedures that have been adopted to comply with the requirements and goals in the plan, including establishing source lists; and a description of its efforts to locate small, small disadvantaged and women-owned small business concerns and award subcontracts to them. The records shall include at least the following (on a plant-wide or company-wide basis, unless otherwise indicated):

(i) Source lists (e.g., PASS), guides, and other data that identify small, small disadvantaged and women-owned small business concerns.

(ii) Organizations contacted in an attempt to locate sources that are small, small disadvantaged or women-owned small business concerns.

(iii) Records on each subcontract solicitation resulting in an award of more than \$100,000, indicating (A) whether small business concerns were solicited and if not, why not, (B) whether small disadvantaged business concerns were solicited and if not, why not, (C) whether women-owned small business concerns were solicited and if not, why not, and (D) if applicable, the reason award was not made to a small business concern.

(iv) Records of any outreach efforts to contact (A) trade associations, (B) business development organizations, and (C) conferences and trade fairs to locate small, small disadvantaged and women-owned small business sources.

(v) Records of internal guidance and encouragement provided to buyers through (A) workshops, seminars, training, etc., and (B) monitoring performance to evaluate compliance with the programs's requirements.

(vi) On a contract-by-contract basis, records to support award data submitted by the offeror to the Government, including the name, address, and business size of each subcontractor. Contractors having company or division-wide annual plans need not comply with this requirement.

(e) In order to effectively implement this plan to the extent consistent with efficient contract performance, the Contractor shall perform the following functions:

(1) Assist small, small disadvantaged and women-owned small business concerns by arranging solicitations, time for the preparation of bids, quantities, specifications, and delivery schedules so as to facilitate the participation by such concerns. Where the contractor's lists of potential small, small disadvantaged and women-owned small business subcontractors are excessively long, reasonable effort shall be made to give all such small business concerns an opportunity to compete over a period of time.

(2) Provide adequate and timely consideration of the potentialities of small, small disadvantaged and women-owned small business concerns in all "make-or-buy" decisions.

(3) Counsel and discuss subcontracting opportunities with representatives of small, small disadvantaged and women-owned small business firms.

(4) Provide notice to subcontractors concerning penalties and remedies for misrepresentations of business status as small, small disadvantaged or women-owned small business for the purpose of obtaining a subcontract that is to be included as part or all of a goal contained in the Contractor's subcontracting plan.

(f) A master subcontracting plan on a plant or division-wide basis which contains all the elements required by (d) of this clause, except goals, may be incorporated by reference as a part of the subcontracting plan required of the offeror by this clause; provided, (1) the master plan has been approved, (2) the offeror ensures that the plan is updated as necessary and provides copies of the approved master plan, including evidence of its approval, to the Contracting Officer, and (3) goals and any deviations from the master plan deemed necessary by the Contracting Officer to satisfy the requirements of this contract are set forth in the individual subcontracting plan.

(g)(1) If a commercial product is offered, the subcontracting plan required by this clause may relate to the offeror's production generally, for both commercial and noncommercial products, rather than solely to the Government contract. In these cases, the offeror shall, with the concurrence

of the Contracting Officer, submit one company-wide or division-wide annual plan.

(2) The annual plan shall be reviewed for approval by the agency awarding the offeror its first prime contract requiring a subcontracting plan during the fiscal year, or by an agency satisfactory to the Contracting Officer.

(3) The approved plan shall remain in effect during the offeror's fiscal year for all of the offeror's commercial products.

(h) Prior compliance of the offeror with other such subcontracting plans under previous contracts will be considered by the Contracting Officer in determining the responsibility of the offeror for award of the contract.

(i) The failure of the Contractor or subcontractor to comply in good faith with (1) the clause of this contract entitled "Utilization of Small, Small Disadvantaged and Women-Owned Small Business Concerns," or (2) an approved plan required by this clause, shall be a material breach of the contract.

128. FAR 52.223-7

NOTICE OF RADIOACTIVE MATERIALS (NOV 1991)
(APPLICABLE IF RADIOACTIVE MATERIALS ARE
INVOLVED - SEE SPECIFICATIONS)

(a) The Contractor shall notify the Contracting Officer or designee, in writing, 14 days prior to the delivery of, or prior to completion of any servicing required by this contract of, items containing either (1) radioactive material requiring specific licensing under the regulations issued pursuant to the Atomic Energy Act of 1954, as amended, as set forth in Title 10 of the Code of Federal Regulations, in effect on the date of this contract, or (2) other radioactive material not requiring specific licensing in which the specific activity is greater than 0.002 microcuries per gram or the activity per item equals or exceeds 0.01 microcuries. Such notice shall specify the part or parts of the items which contain radioactive materials, a description of the materials, the name and activity of the isotope, the manufacturer of the materials, and any other information known to the Contractor which will put users of the items on notice as to the hazards involved (OMB No. 9000-0107).

(b) If there has been no change affecting the quantity of activity, or the characteristics and composition of the radioactive material from deliveries under this contract or prior contracts, the Contractor may request that the Contracting Officer or designee waive the notice requirement in paragraph (a) of this clause. Any such request shall--

(1) Be submitted in writing;

(2) Contain a certification that the quantity of activity, characteristics, and composition of the radioactive material have not changed; and

(3) Cite the contract number on which the prior notification was submitted and the contracting office to which it was submitted.

(c) All items, parts, or subassemblies which contain radioactive materials in which the specific activity is greater than 0.002 microcuries per gram or activity per item equals or exceeds 0.01 microcuries, and all containers in which such items, parts or subassemblies are delivered to the Government shall be clearly marked and labeled as required by the latest revision of MIL-STD 129 in effect on the date of the contract.

(d) This clause, including this paragraph (d), shall be inserted in all subcontracts for radioactive materials meeting the criteria in paragraph (a) of this clause.

129. FAR 52.225-5

BUY AMERICAN ACT -- CONSTRUCTION MATERIALS (MAY 1997)

(a) Definitions. As used in this clause --

"Components" means those articles, materials, and supplies incorporated directly into construction materials.

"Construction material" means an article, material, or supply brought to the construction site for incorporation into the building or work.

Construction material also includes an item brought to the site pre-assembled from articles, materials or supplies. However, emergency life safety systems, such as emergency lighting, fire alarm, and audio evacuation systems, which are discrete systems incorporated into a public building or work and which are produced as a complete system, shall be evaluated as a single and distinct construction material regardless of when or how the individual parts or components of such systems are delivered to the construction site.

"Domestic construction material" means (1) an unmanufactured construction material mined or produced in the United States, or (2) a construction material manufactured in the United States, if the cost of its components mined, produced, or manufactured in the United States exceeds 50 percent of the cost of all its components. Components of foreign origin of the same class or kind as the construction materials determined to be unavailable pursuant to subparagraph 25.202(a)(2) of the Federal Acquisition Regulation (FAR) shall be treated as domestic.

(b)(1) The Buy American Act (41 U.S.C. 10a-10d) requires that only domestic construction material be used in performing this contract, except as provided in paragraphs (b)(2) and (b)(3) of this clause.

(2) This requirement does not apply to the excepted construction materials or components listed by the Government as follows:

(List applicable accepted materials or indicate "none")

(3) Other foreign construction material may be added to the list in paragraph (b)(2) of this clause if the Government determines that --

(i) The cost would be unreasonable (the cost of a particular domestic construction material shall be determined to be unreasonable when the cost of such material exceeds the cost of foreign material by more than 6 percent, unless the agency head determines a higher percentage to be appropriate);

(ii) The application of the restriction of the Buy American Act to a particular construction material would be impracticable or inconsistent with the public interest; or

(iii) The construction material is not mined, produced, or manufactured in the United States in sufficient and reasonably available commercial quantities of a satisfactory quality.

(4) The Contractor agrees that only domestic construction material will be used by the Contractor, subcontractors, material men, and suppliers in the performance of this contract, except for foreign construction materials, if any listed in paragraph (b)(2) of this clause.

(c) Request for determination. (1) Contractors requesting to use foreign construction material under paragraph (b)(3) of this clause shall provide adequate information for Government evaluation of the request for a determination regarding the inapplicability of the Buy American Act. Each submission shall include a description of the foreign and domestic construction materials, including unit of measure, quantity, price, time of delivery or availability, location of the construction project, name and address of the proposed contractor, and a detailed justification of the reason for use of foreign materials cited in accordance with paragraph (b)(3) of this clause. A submission based on unreasonable cost shall include a reasonable survey of the marked and a completed price comparison table in the format in paragraph (d) of this clause. The price of construction material shall include all delivery costs to the construction site and any applicable duty (whether or not a duty-free certificate may be issued).

(2) If the Government determines after contract award that an exception to the Buy American Act applies, the contract shall be modified to allow use of the foreign construction material, and adequate consideration shall be negotiated. However, when the basis for the exception is the unreasonable price of a domestic construction material, adequate consideration shall not be less than the differential established in paragraph (b)(3)(i) of this clause.

(3) If the Government does not determine that an exception to the Buy American Act applies, the use of that particular foreign construction material will be a failure to comply with the Act.

(d) For evaluation of requests under paragraph (c) of this clause based on unreasonable cost, the following information and any applicable supporting data based on the survey of suppliers shall be included in the request:

FOREIGN AND DOMESTIC CONSTRUCTION
MATERIALS PRICE COMPARISON

CONSTRUCTION MATERIAL DESCRIPTION	UNIT OF MEASURE	QUANTITY	PRICE (DOLLARS) *
Item 1:			
Foreign construction material	_____	_____	_____
Domestic construction material	_____	_____	_____
Item 2:			
Foreign construction material	_____	_____	_____
Domestic construction material	_____	_____	_____

List name, address telephone number, and contact for suppliers surveyed.
Attach copy of response; if oral, attach summary.

Include other applicable supporting information.

*Include all delivery costs to the construction site and any applicable duty
(whether or not a duty-free entry certificate is issued).

130. FAR 52.225-15 BUY AMERICAN ACT -- CONSTRUCTION MATERIALS UNDER
TRADE AGREEMENTS ACT AND NORTH AMERICAN FREE
TRADE AGREEMENT (MAY 1997)

(a) Definitions. As used in this clause--

"Components" means those articles, materials, and supplies incorporated
directly into construction materials.

"Construction material" means an article, material, or supply brought to
the construction site for incorporation into the building or work.
Construction material also includes an item brought to the site pre-assembled
from articles, materials, or supplies. However, emergency life safety
systems, such as emergency lighting, fire alarm, and audio evacuation
systems, which are discrete systems incorporated into a public building or
work and which are produced as a complete system, shall be evaluated as a
single and distinct construction material regardless of when or how the
individual parts or components of such systems are delivered to the
construction site.

"Designated country construction material" means a construction material
that-- (1) Is wholly the growth, product, or manufacture of a designated
country (as defined at FAR 25.401); or (2) In the case of a construction
material which consists in whole or in part of materials from another country
or instrumentality, has been substantially transformed in a designated country
into a new and different construction material distinct from the materials
from which it was transformed.

"Domestic construction material" means (1) an unmanufactured construction
material mined or produced in the United States, or (2) a construction
material manufactured in the United States, if the cost of its components
mined, produced, or manufactured in the United States exceeds 50 percent of
the cost of all its components. Components of foreign origin of the same
class or kind as the construction materials determined to be unavailable

pursuant to subparagraph 25.202(a)(2) of the Federal Acquisition Regulation (FAR) shall be treated as domestic.

"North American Free Trade Agreement (NAFTA) country" means Canada or Mexico.

"NAFTA country construction material" means a construction material that-- (1) Is wholly the growth, product, or manufacture of a NAFTA country; or (2) In the case of a construction material which consists in whole or in part of materials from another country or instrumentality, has been substantially transformed in a NAFTA country into a new and different construction material distinct from the materials from which it was transformed.

(b)(1) The Buy American Act (41 U.S.C. 10a - 10d) requires that only domestic construction material be used in performing this contract, except as provided in paragraphs (b)(2), (b)(3), and (b)(4) of this clause.

(2) The Trade Agreements Act and the North American Free Trade Agreement (NAFTA) provide that designated country and NAFTA country construction materials are exempted from application of the Buy American Act.

(3) The requirement in paragraph (b)(1) of this clause does not apply to the excepted construction material or components listed by the Government as follows:

List applicable excepted materials or indicate "None"

(4) Other foreign construction material may be added to the list in paragraph (b)(3) of this clause if the Government determines that--

(i) The cost would be unreasonable (the cost of a particular domestic construction material shall be determined to be unreasonable when the cost of such material exceeds the cost of foreign material by more than 6 percent, unless the agency head determines a higher percentage to be appropriate);

(ii) The application of the restriction of the Buy American Act to a particular construction material would be impracticable or inconsistent with the public interest; or

(iii) The construction material is not mined, produced, or manufactured in the United States in sufficient and reasonably available commercial quantities of a satisfactory quality.

(5) The Contractor agrees that only domestic construction materials, NAFTA country construction materials, or designated country construction materials will be used by the Contractor, subcontractors, material men, and suppliers in the performance of this contract, except for foreign construction materials, if any, listed in paragraph (b)(3) of this clause.

(c) Request for determination. (1) Contractors requesting to use foreign construction material under paragraph (b)(4) of this clause shall provide adequate information for Government evaluation of the request for a determination regarding the inapplicability of the Buy American Act. Each submission shall include a description of the foreign and domestic construction materials, including unit of measure, quantity, price, time of delivery or availability, location of the construction project, name and address of the proposed contractor, and a detailed justification of the reason for use of foreign materials cited in accordance with paragraph (b)(4) of this clause. A submission based on unreasonable cost shall include a reasonable survey of the market and a completed price comparison table in the format in paragraph (d) of this clause. The price of construction material shall include all delivery costs to the construction site and any applicable duty (whether or not a duty-free certificate may be issued).

(2) If the Government determines after contract award that an exception to the Buy American Act applies, the contract shall be modified to allow use of the foreign construction material, and adequate consideration shall be negotiated. However, when the basis for the exception is the unreasonable

price of a domestic construction material, adequate consideration shall not be less than the differential established in paragraph (b)(4)(i) of this clause.

(3) If the Government does not determine that an exception to the Buy American Act applies, the use of that particular foreign construction material will be a failure to comply with the Act.

(d) For evaluation of requests under paragraph (c) of this clause based on unreasonable cost, the following information and any applicable supporting data based on the survey of suppliers shall be included in the request:

FOREIGN AND DOMESTIC CONSTRUCTION
MATERIALS PRICE COMPARISON

CONSTRUCTION MATERIAL DESCRIPTION	UNIT OF MEASURE	QUANTITY	PRICE (DOLLARS) *
Item 1:			
Foreign construction material	_____	_____	_____
Domestic construction material	_____	_____	_____
Item 2:			
Foreign construction material	_____	_____	_____
Domestic construction material	_____	_____	_____

List name, address telephone number, and contact for suppliers surveyed.
Attach copy of response; if oral, attach summary.

Include other applicable supporting information.

*Include all delivery costs to the construction site and any applicable duty (whether or not a duty-free entry certificate is issued).

131. FAR 52.225-15 I BUY AMERICAN ACT -- CONSTRUCTION MATERIALS UNDER
TRADE AGREEMENTS ACT AND NORTH AMERICAN FREE
TRADE AGREEMENT (MAY 1997)-- ALTERNATE I (MAY
1997)

(a) Definitions. As used in this clause--

"Components" means those articles, materials, and supplies incorporated directly into construction materials.

"Construction material" means an article, material, or supply brought to the construction site for incorporation into the building or work. Construction material also includes an item brought to the site pre-assembled from articles, materials, or supplies. However, emergency life safety systems, such as emergency lighting, fire alarm, and audio evacuation systems, which are discrete systems incorporated into a public building or work and which are produced as a complete system, shall be evaluated as a single and distinct construction material regardless of when or how the individual parts or components of such systems are delivered to the construction site.

"Designated country construction material" means a construction material that-- (1) Is wholly the growth, product, or manufacture of a designated country (as defined at FAR 25.401); or (2) In the case of a construction

material which consists in whole or in part of materials from another country or instrumentality, has been substantially transformed in a designated country into a new and different construction material distinct from the materials from which it was transformed.

"Domestic construction material" means (1) an unmanufactured construction material mined or produced in the United States, or (2) a construction material manufactured in the United States, if the cost of its components mined, produced, or manufactured in the United States exceeds 50 percent of the cost of all its components. Components of foreign origin of the same class or kind as the construction materials determined to be unavailable pursuant to subparagraph 25.202(a)(2) of the Federal Acquisition Regulation (FAR) shall be treated as domestic.

"North American Free Trade Agreement (NAFTA) country" means Canada or Mexico.

"NAFTA country construction material" means a construction material that-- (1) Is wholly the growth, product, or manufacture of a NAFTA country; or (2) In the case of a construction material which consists in whole or in part of materials from another country or instrumentality, has been substantially transformed in a NAFTA country into a new and different construction material distinct from the materials from which it was transformed.

(b)(1) The Buy American Act (41 U.S.C. 10a - 10d) requires that only domestic construction material be used in performing this contract, except as provided in paragraphs (b)(2), (b)(3), and (b)(4) of this clause.

(2) The North American Free Trade Agreement (NAFTA) provides that NAFTA construction materials are exempted from application of the Buy American Act.

(3) The requirement in paragraph (b)(1) of this clause does not apply to the excepted construction material or components listed by the Government as follows:

List applicable excepted materials or indicate "None"

(4) Other foreign construction material may be added to the list in paragraph (b)(3) of this clause if the Government determines that--

(i) The cost would be unreasonable (the cost of a particular domestic construction material shall be determined to be unreasonable when the cost of such material exceeds the cost of foreign material by more than 6 percent, unless the agency head determines a higher percentage to be appropriate);

(ii) The application of the restriction of the Buy American Act to a particular construction material would be impracticable or inconsistent with the public interest; or

(iii) The construction material is not mined, produced, or manufactured in the United States in sufficient and reasonably available commercial quantities of a satisfactory quality.

(5) The Contractor agrees that only domestic construction materials, or NAFTA country construction materials will be used by the Contractor, subcontractors, material men, and suppliers in the performance of this contract, except for foreign construction materials, if any, listed in paragraph (b)(3) of this clause.

(c) Request for determination. (1) Contractors requesting to use foreign construction material under paragraph (b)(4) of this clause shall provide adequate information for Government evaluation of the request for a determination regarding the inapplicability of the Buy American Act. Each submission shall include a description of the foreign and domestic construction materials, including unit of measure, quantity, price, time of delivery or availability, location of the construction project, name and address of the proposed contractor, and a detailed justification of the reason for use of foreign materials cited in accordance with paragraph (b)(4) of this clause. A submission based on unreasonable cost shall include a reasonable

survey of the market and a completed price comparison table in the format in paragraph (d) of this clause. The price of construction material shall include all delivery costs to the construction site and any applicable duty (whether or not a duty-free certificate may be issued).

(2) If the Government determines after contract award that an exception to the Buy American Act applies, the contract shall be modified to allow use of the foreign construction material, and adequate consideration shall be negotiated. However, when the basis for the exception is the unreasonable price of a domestic construction material, adequate consideration shall not be less than the differential established in paragraph (b)(4)(i) of this clause.

(3) If the Government does not determine that an exception to the Buy American Act applies, the use of that particular foreign construction material will be a failure to comply with the Act.

(d) For evaluation of requests under paragraph (c) of this clause based on unreasonable cost, the following information and any applicable supporting data based on the survey of suppliers shall be included in the request:

FOREIGN AND DOMESTIC CONSTRUCTION
MATERIALS PRICE COMPARISON

CONSTRUCTION MATERIAL DESCRIPTION	UNIT OF MEASURE	QUANTITY	PRICE (DOLLARS) *
Item 1:			
Foreign			
construction			
material	_____	_____	_____
Domestic			
construction			
material	_____	_____	_____
Item 2:			
Foreign			
construction			
material	_____	_____	_____
Domestic			
construction			
material	_____	_____	_____

List name, address telephone number, and contact for suppliers surveyed.
Attach copy of response; if oral, attach summary.

Include other applicable supporting information.

*Include all delivery costs to the construction site and any applicable duty (whether or not a duty-free entry certificate is issued).

132. DFARS 252.225-7031 SECONDARY ARAB BOYCOTT OF ISRAEL (JUN 1992)

(A) Definitions.

As used in this clause--

"Foreign Person" means any person other than a United States person as defined in Section 16(2) of the Export Administration Act of 1979 (50 U.S.C. APP. SEC 2415).

"United States Person" is defined in Section 16(2) of the Export Administration Act of 1979 and means any United States resident or national (other than an individual resident outside the United States and employed by other than a United States person), any domestic concern (including any permanent domestic establishment of any foreign concern), and any foreign subsidiary or affiliate (including any permanent foreign establishment) of any domestic concern which is controlled in fact by such domestic concern, as determined under regulations of the President.

(B) Certification.

By submitting this offer, the offeror, if a foreign person, company or entity, certifies that it--

- (1) Does not comply with the secondary Arab boycott of Israel; and
- (2) Is not taking or knowingly agreeing to take any action, with respect to the secondary boycott of Israel by Arab countries, which 50 U.S.C. APP. SEC 2407(A) prohibits a United States person from taking.

133. SAACONS 52.236-4820

ORDER OF PRECEDENCE (JAN 1993)

In regard to FAR contract clause 52.214-29, Order of Precedence-Sealed Bidding, the contract drawings are considered to be an attachment to the specifications and are not "other documents, exhibits, and attachments". For the order of precedence between the specifications and drawings, see FAR contract clause 52.236-21, Alternate I.

134. FAR 52.243-7

NOTIFICATION OF CHANGES (APR 1984)

(a) Definitions. "Contracting Officer," as used in this clause, does not include any representative of the Contracting Officer. "Specifically authorized representative (SAR)," as used in this clause, means any person the Contracting Officer has so designated by written notice (a copy of which shall be provided to the Contractor) which shall refer to this subparagraph and shall be issued to the designated representative before the SAR exercises such authority.

(b) Notice. The primary purpose of this clause is to obtain prompt reporting of Government conduct that the Contractor considers to constitute a change to this contract. Except for changes identified as such in writing and signed by the Contracting Officer, the Contractor shall notify the Administrative Contracting Officer in writing promptly, within 14 calendar days from the date that the Contractor identifies any Government conduct (including actions, inactions, and written or oral communications) that the Contractor regards as a change to the contract terms and conditions. On the basis of the most accurate information available to the Contractor, the notice shall state--

- (1) The date, nature, and circumstances of the conduct regarded as a change;
- (2) The name, function, and activity of each Government individual and Contractor official or employee involved in or knowledgeable about such conduct;
- (3) The identification of any documents and the substance of any oral communication involved in such conduct;
- (4) In the instance of alleged acceleration of scheduled performance or delivery, the basis upon which it arose;
- (5) The particular elements of contract performance for which the Contractor may seek an equitable adjustment under this clause, including--
 - (i) What contract line items have been or may be affected by the alleged change;
 - (ii) What labor or materials or both have been or may be added, deleted, or wasted by the alleged change;
 - (iii) To the extent practicable, what delay and disruption in the manner and sequence of performance and effect on continued performance have been or may be caused by the alleged change;
 - (iv) What adjustments to contract price, delivery schedule, and other provisions affected by the alleged change are estimated; and
- (6) The Contractor's estimate of the time by which the Government must respond to the Contractor's notice to minimize cost, delay or disruption of performance.

(c) Continued performance. Following submission of the notice required by (b) above, the Contractor shall diligently continue performance of this contract to the maximum extent possible in accordance with its terms and conditions as construed by the Contractor, unless the notice reports a direction of the Contracting Officer or a communication from a SAR of the

Contracting Officer, in either of which events the Contractor shall continue performance; provided, however, that if the Contractor regards the direction or communication as a change as described in (b) above, notice shall be given in the manner provided. All directions, communications, interpretations, orders and similar actions of the SAR shall be reduced to writing promptly and copies furnished to the Contractor and to the Contracting Officer. The Contracting Officer shall promptly countermand any action which exceeds the authority of the SAR.

(d) Government response. The Contracting Officer shall promptly, within 14 calendar days after receipt of notice, respond to the notice in writing. In responding, the Contracting Officer shall either--

(1) Confirm that the conduct of which the Contractor gave notice constitutes a change and when necessary direct the mode of further performance;

(2) Countermand any communication regarded as a change;

(3) Deny that the conduct of which the Contractor gave notice constitutes a change and when necessary direct the mode of further performance; or

(4) In the event the Contractor's notice information is inadequate to make a decision under (1), (2), or (3) above, advise the Contractor what additional information is required, and establish the date by which it should be furnished and the date thereafter by which the Government will respond.

(e) Equitable adjustments.

(1) If the Contracting Officer confirms that Government conduct effected a change as alleged by the Contractor, and the conduct causes an increase or decrease in the Contractor's cost of, or the time required for, performance of any part of the work under this contract, whether changed or not changed by such conduct, an equitable adjustment shall be made--

(i) In the contract price or delivery schedule or both; and

(ii) In such other provisions of the contract as may be affected.

(2) The contract shall be modified in writing accordingly. In the case of drawings, designs or specifications which are defective and for which the Government is responsible, the equitable adjustment shall include the cost and time extension for delay reasonably incurred by the Contractor in attempting to comply with the defective drawings, designs or specifications before the Contractor identified, or reasonably should have identified, such defect. When the cost of property made obsolete or excess as a result of a change confirmed by the Contracting Officer under this clause is included in the equitable adjustment, the Contracting Officer shall have the right to prescribe the manner of disposition of the property. The equitable adjustment shall not include increased costs or time extensions for delay resulting from the Contractor's failure to provide notice or to continue performance as provided, respectively, in (b) and (c) above.

135. DFARS 252.247-7023

TRANSPORTATION OF SUPPLIES BY SEA (NOV 1995)

(a) Definitions. As used in this clause--

(1) "Components" means articles, materials, and supplies incorporated directly into end products at any level of manufacture, fabrication, or assembly by the Contractor or any subcontractor.

(2) "Department of Defense (DoD)" means the Army, Navy, Air Force, Marine Corps, and defense agencies.

(3) "Foreign flag vessel" means any vessel that is not a U.S.-flag vessel.

(4) "Ocean transportation" means any transportation aboard a ship, vessel, boat, barge, or ferry through international waters.

(5) "Subcontractor" means a supplier, materialman, distributor, or vendor at any level below the prime Contractor whose contractual obligation to perform results from, or is conditioned upon, award of the prime contract and who is performing any part of the work or other requirement of the prime contract. However, effective May 1, 1996, the term does not include a supplier, materialman, distributor, or vendor of commercial items or commercial components.

(6) "Supplies" means all property, except land and interests in land, that is clearly identifiable for eventual use by or owned by the DoD at the time of transportation by sea.

(i) An item is clearly identifiable for eventual use by the DoD if, for example, the contract documentation contains a reference to a DoD contract number or a military destination.

(ii) Supplies includes (but is not limited to) public works; buildings and facilities; ships; floating equipment and vessels of every character, type, and description, with parts, subassemblies, accessories, and equipment; machine tools; material; equipment; stores of all kinds; end items; construction materials; and components of the foregoing.

(7) "U.S.-flag vessel" means a vessel of the United States or belonging to the United States, including any vessel registered or having national status under the laws of the United States.

(b) The Contractor shall employ U.S.-flag vessels in the transportation by sea of any supplies to be furnished in the performance of this contract. The Contractor and its subcontractors may request that the Contracting Officer authorize shipment in foreign-flag vessels, or designate available U.S.-flag vessels, if the Contractor or a subcontractor believes that--

(1) U.S.-flag vessels are not available for timely shipment;

(2) The freight charges are inordinately excessive or unreasonable; or

(3) Freight charges are higher than charges to private persons for transportation of like goods.

(c) The Contractor must submit any request for use of other than U.S.-flag vessels in writing to the Contracting Officer at least 45 days prior to the sailing date necessary to meet its delivery schedules. The Contracting Officer will process requests submitted after such date(s) as expeditiously as possible, but the Contracting Officer's failure to grant approvals to meet the shipper's sailing date will not of itself constitute a compensable delay under this or any other clause of this contract. Requests shall contain at a minimum--

(1) Type, weight, and cube of cargo;

(2) Required shipping date;

(3) Special handling and discharge requirements;

(4) Loading and discharge points;

(5) Name of shipper and consignee;

(6) Prime contract number; and

(7) A documented description of efforts made to secure U.S.-flag vessels, including points of contact (with names and telephone numbers) with at least two U.S.-flag carriers contacted. Copies of telephone notes, telegraphic and facsimile message or letters will be sufficient for this purpose.

(d) The Contractor shall, within 30 days after each shipment covered by this clause, provide the Contracting Officer and the Division of National Cargo, Office of Market Development, Maritime Administration, U.S. Department of Transportation, Washington, DC 20590, one copy of the rated on board vessel operating carrier's ocean bill of lading, which shall contain the following information--

(1) Prime contract number;

(2) Name of vessel;

(3) Vessel flag of registry;

(4) Date of loading;

(5) Port of loading;

(6) Port of final discharge;

(7) Description of commodity;

(8) Gross weight in pounds and cubic feet if available;

(9) Total ocean freight in U.S. dollars; and

(10) Name of the steamship company.

(e) The Contractor agrees to provide with its final invoice under this contract a representation that to the best of its knowledge and belief--

(1) No ocean transportation was used in the performance of this contract;

(2) Ocean transportation was used and only U.S.-flag vessels were used for all ocean shipments under the contract;

(3) Ocean transportation was used, and the Contractor had the written consent of the Contracting Officer for all non-U.S.-flag ocean transportation; or

(4) Ocean transportation was used and some or all of the shipments were made on non-U.S.-flag vessels without the written consent of the Contracting Officer. The Contractor shall describe these shipments in the following format:

	Item Description	Contract Line Items	Quantity
Total....			

(f) If the final invoice does not include the required representation, the Government will reject and return it to the Contractor as an improper invoice for the purposes of the Prompt Payment clause of this contract. In the event there has been unauthorized use of non-U.S.-flag vessels in the performance of this contract, the Contracting Officer is entitled to equitably adjust the contract, based on the unauthorized use.

(g) The Contractor shall include this clause, including this paragraph (g) in all subcontracts under this contract, which exceed the simplified acquisition threshold in Part 13 of the Federal Acquisition Regulation.

136. FAR 52.252-4 ALTERATIONS IN CONTRACT (APR 1984)

Portions of this contract are altered as follows: None

137. FAR 52.252-6 AUTHORIZED DEVIATIONS IN CLAUSES (APR 1984)

(a) The use in this solicitation or contract of any Federal Acquisition Regulation (48 CFR Chapter 1) clause with an authorized deviation is indicated by the addition of "(DEVIATION)" after the date of the clause.

(b) The use in this solicitation or contract of any Department of Defense FAR Supplement (48 CFR Chapter 2) clause with an authorized deviation is indicated by the addition of "(DEVIATION)" after the name of the regulation.

138. DFARS 252.223-7004 DRUG-FREE WORK FORCE (SEP 1988)

(a) Definitions.

(1) "Employee in a sensitive position," as used in this clause, means an employee who has been granted access to classified information; or employees in other positions that the Contractor determines involve national security, health or safety, or functions other than the foregoing requiring a high degree of trust and confidence.

(2) "Illegal drugs," as used in this clause, means controlled substances included in Schedules I and II, as defined by section 802(6) of Title 21 of the United States Code, the possession of which is unlawful under Chapter 13 of that Title. The term "illegal drugs" does not mean the use of a controlled substance pursuant to a valid prescription or other uses authorized by law.

(b) The Contractor agrees to institute and maintain a program for achieving the objective of a drug-free work force. While this clause defines criteria for such a program, contractors are encouraged to implement alternative approaches comparable to the criteria in paragraph (c) that are designed to achieve the objectives of this clause.

(c) Contractor programs shall include the following, or appropriate alternatives:

(1) Employee assistance programs emphasizing high level direction, education, counseling, rehabilitation, and coordination with available community resources;

(2) Supervisory training to assist in identifying and addressing illegal drug use by Contractor employees;

(3) Provisions for self-referrals as well as supervisory referrals to treatment with maximum respect for individual confidentiality consistent with safety and security issues;

(4) Provision for identifying illegal drug users, including testing on a controlled and carefully monitored basis. Employee drug testing programs shall be established taking account of the following:

(i) The Contractor shall establish a program that provides for testing for the use of illegal drugs by employees in sensitive positions. The extent of and criteria for such testing shall be determined by the Contractor based on considerations that include the nature of the work being performed under the contract, the employee's duties, the efficient use of Contractor resources, and the risks to health, safety, or national security that could result from the failure of an employee adequately to discharge his or her position.

(ii) In addition, the Contractor may establish a program for employee drug testing--

(A) When there is a reasonable suspicion that an employee uses illegal drugs; or

(B) When an employee has been involved in an accident or unsafe practice;

(C) As part of or as a follow-up to counseling or rehabilitation for illegal drug use;

(D) As part of a voluntary employee drug testing program

(iii) The Contractor may establish a program to test applicants for employment for illegal drug use.

(iv) For the purpose of administering this clause, testing for illegal drugs may be limited to those substances for which testing is prescribed by section 2.1 of Subpart B of the "Mandatory Guidelines for Federal Workplace Drug Testing Programs" (53FR 11980 (April 11, 1988)), issued by the Department of Health and Human Services.

(d) Contractors shall adopt appropriate personnel procedures to deal with employees who are found to be using drugs illegally. Contractors shall not allow any employee to remain on duty or perform in a sensitive position who is found to use illegal drugs until such time as the Contractor, in accordance with procedures established by the Contractor, determines that the employee may perform in such a position.

(e) The provisions of this clause pertaining to drug testing programs shall not apply to the extent they are inconsistent with state or local law, or with an existing collective bargaining agreement; provided that with respect to the latter, the Contractor agrees that those issues that are in conflict will be a subject of negotiation at the next collective bargaining session.

139. EFARS 52.249-5000

BASIS FOR SETTLEMENT OF PROPOSALS (DEC 1995)

Actual costs will be used to determine equipment costs for a settlement proposal submitted on the total cost basis under FAR 49.206-2(b). In evaluating a termination settlement proposal using the total cost basis, the following principles will be applied to determine allowable equipment costs:

(1) Actual costs for each piece of equipment or groups of similar serial or series equipment need not be available in the Contractor's accounting records to determine total actual equipment costs.

(2) If equipment costs have been allocated to a contract using predetermined rates, those charges will be adjusted to actual costs.

(3) Recorded job costs adjusted for unallowable expenses will be used to determine equipment operating expenses.

(4) Ownership costs (depreciation) will be determined using the Contractor's depreciation schedule (subject to the provisions of FAR 31.205-11).

(5) License, taxes, storage and insurance costs are normally recovered as an indirect expense and unless the Contractor charges these costs directly to contracts, they will be recovered through the indirect expense rate.

END OF SECTION

SECTION 00800
SPECIAL CONTRACT REQUIREMENTS

SECTION 00800

SPECIAL CONTRACT REQUIREMENTS

1. FAR 52.252-1 SOLICITATION PROVISIONS INCORPORATED BY
REFERENCE (JUN 1988)

This solicitation incorporates one or more solicitation provisions by reference, with the same force and effect as if they were given in full text. Upon request, the Contracting Officer will make their full text available.

SOLICITATION PROVISIONS BY REFERENCE:

2. FAR 52.211-13 TIME EXTENSIONS (APR 1984)
3. FAR 52.223-14 TOXIC CHEMICAL RELEASE REPORTING (OCT 1996)
4. FAR 52.228-5 INSURANCE--WORK ON A GOVERNMENT INSTALLATION
(JAN 1997)
5. FAR 52.246-12 INSPECTION OF CONSTRUCTION (AUG 1996)

THE FOLLOWING SOLICITATION PROVISIONS ARE INCLUDED IN FULL TEXT

6. FAR 52.204-4 PRINTING/COPYING DOUBLE-SIDED ON RECYCLED PAPER
(JUN 1996)
7. DFARS 252.204-7003 CONTROL OF GOVERNMENT PERSONNEL
WORK PRODUCT (APR 1992)
8. FAR 52.211-10 COMMENCEMENT, PROSECUTION, AND COMPLETION
OF WORK (APR 1994)
9. FAR 52.211-12 LIQUIDATED DAMAGES--CONSTRUCTION
(APR 1984)
10. SAACONS 52.0211.4853 WORK DAYS AND HOURS (APR 1992)
11. SAACONS 52.0215-4101 ALTERNATE STRUCTURED APPROACH TO WEIGHTED
GUIDELINE METHOD FOR CONSTRUCTION CONTRACTS
(EFARS 15.973-100) (MAY 1995)
12. SAACONS 52.0219-4509 SUBCONTRACTING WITH SMALL, SMALL DISADVANTAGED
AND WOMEN-OWNED SMALL BUSINESSES (JAN 1996)
13. DFARS 252.223-7006 PROHIBITION ON STORAGE AND DISPOSAL OF TOXIC AND
HAZARDOUS MATERIALS
(APR 1993)
14. SAACONS 52.0223-4803 HAZARDOUS MATERIALS DELIVERED UNDER THIS
CONTRACT (MAY 1993)
15. SAACONS 52.0228-4502 MINIMUM INSURANCE REQUIRED (MAY 1993)
16. EFARS 52.231-5000 EQUIPMENT OWNERSHIP AND OPERATING
EXPENSE SCHEDULE (MAR 1995)--EFARS
17. FAR 52.232-27 PROMPT PAYMENT FOR CONSTRUCTION CONTRACTS
(MAR 1994)
18. DFARS 252.232-7006 REDUCTION OR SUSPENSION OF CONTRACT PAYMENTS
UPON FINDING OF FRAUD
(AUG 1992)
19. FAR 52.236-1 PERFORMANCE OF WORK BY THE CONTRACTOR
(APR 1984)
20. FAR 52.236-4 PHYSICAL DATA (APR 1984)
21. DFARS 252.236-7001 CONTRACT DRAWINGS, MAPS, AND SPECIFICATIONS
(DEC 1991)

- 22. SAACONS 52.0236-4801 SALVAGE AND SCRAP GOVERNMENT PROPERTY
(OCT 1993)
- 23. SAACONS 52.0236-4581 AVAILABILITY OF UTILITIES SERVICES
(APR 1992)
- 24. FAR 52.245-3 IDENTIFICATION OF GOVERNMENT-FURNISHED PROPERTY
(APR 1984)

FULL TEXT SOLICITATION PROVISIONS:

6. FAR 52.204-4 PRINTING/COPYING DOUBLE-SIDED ON RECYCLED PAPER
(JUN 1996)

(a) In accordance with Executive Order 12873, dated October 20, 1993, as amended by Executive Order 12995, dated March 25, 1996, the Offeror/Contractor is encouraged to submit paper documents, such as offers, letters, or reports, that are printed/copied double-sided on recycled paper that has at least 20% postconsumer material.

(b) The 20% standard applies to high-speed copies paper, offset paper, forms bond, computer printout paper, and carbonless paper, file folders, white woven envelopes, and other uncoated printed and writing paper, such as writing and office paper, book paper, cotton fiber paper, and cover stock. An alternative to meeting the 20 % postconsumer material standard is 50 % recovered material content of certain industrial by-products.

7. DFARS 252.204-7003 CONTROL OF GOVERNMENT PERSONNEL
WORK PRODUCT (APR 1992)

The Contractor's procedures for protecting against unauthorized disclosure of information shall not require Department of Defense employees or members of the Armed Forces to relinquish control of their work products, whether classified or not, to the Contractor.

8. FAR 52.211-10 COMMENCEMENT, PROSECUTION, AND COMPLETION
OF WORK (APR 1994)

The Contractor shall be required to (a) commence work under this contract within **(10)** calendar days after the date the Contractor receives the notice to proceed, (b) prosecute the work diligently, and (c) complete the entire work ready for use not later than 540 calendar days after receipt of notice to proceed. The time stated for completion shall include final cleanup of the premises.

9. FAR 52.211-12 LIQUIDATED DAMAGES--CONSTRUCTION
(APR 1984)

(a) If the Contractor fails to complete the work within the time specified in the contract, or any extension, the Contractor shall pay to the Government as liquidated damages, the sum of \$915 for each day of delay.

(b) If the Government terminates the Contractor's right to proceed, the resulting damage will consist of liquidated damages until such reasonable time as may be required for final completion of the work together with any increased costs occasioned the Government in completing the work.

(c) If the Government does not terminate the Contractor's right to proceed, the resulting damage will consist of liquidated damages until the work is completed or accepted.

10. SAACONS 52.0211.4853 WORK DAYS AND HOURS (APR 1992)

The normal work days and hours for this project will be Monday through Friday, excluding federal holidays, from 7:30 a.m. to 4:00 p.m. Access to the work site may be restricted to these hours and days. Work during other than normal hours and days must be coordinated in advance with the Administrative Contracting Officer.

11. SAACONS 52.0215-4101 ALTERNATE STRUCTURED APPROACH TO WEIGHTED
GUIDELINE METHOD FOR CONSTRUCTION CONTRACTS
(EFARS 15.973-100) (MAY 1995)

The following alternate structured approach shall be used for all fixed-price construction contract actions.

<u>Factor</u>	<u>Rate</u>	<u>Weight</u>	<u>Value</u>
Degree of risk	20		
Relative difficulty of work	15		
Size of job	15		
Period of performance	15		
Contractor's investment	5		
Assistance by Government	5		
Subcontracting	25		
Total	100%		

Based on the circumstances of the procurement action, each of the above factors shall be weighted from .03 to .12 as indicated below. "Value shall be obtained by multiplying the rate by the weight. The Value column when totaled indicates the fair and reasonable profit percentage under the circumstances of the particular procurement. The profit percentage should be multiplied by the total contract costs, including general and administrative costs.

(1) Degree of risk. Where the work involves no risk or the degree of risk is very small, the weighting should be .03; as the degree of risk increases, the weighting should be increased up to a maximum of .12. Lump sum items shall generally have a higher weight than unit price items; other things to consider include the nature of the work and where it is to be performed. Consider the portion of the work to be done by subcontractors, amount and type of labor included in costs, whether the negotiation is before or after performance of the work, etc. Modifications settled before the fact have much greater risk than those settled after the fact. A weight of .03 is appropriate for after the fact equitable adjustments and/or settlements.

(2) Relative Difficulty of Work: If the work is difficult and complex, the weight should be .12 and should be proportionately reduced to .03 on the simplest of jobs. This factor is tied in to some extent with the degree of risk. Some other things to consider are the nature of the work, by whom it is to be done (i.e., subcontractors, consultants), what is the time schedule.

(3) Size of Job. Work of \$100,000 or less shall be weighted at .12. Work estimated between \$100,000 and \$5,000,000 shall be proportionately weighted from .12 to .05. Work from \$5,000,000 to \$10,000,000 shall be weighted at .04. Work in excess of \$10,000,000 shall be weighted at .03. It should be noted that control of fixed expenses generally improves with increased job magnitude.

(4) Period of Performance. Work not to exceed one month is to be proportionately weighted at .03. Work in excess of 24 months is to be weighted at .12. Durations between one month and 24 months are to be proportionately weighted between .03 and .12.

(5) Contractor's Investment. To be weighted from .03 to .12 on the basis of below average, average and above average. Things to consider include amount of subcontracting, Government-furnished property or data such as surveys, soil tests, method of making progress payments, and any mobilization payment items.

(6) Assistance by Government. To be weighted from .12 to .03 on the basis of average to above average. Consider use of Government-owned property, equipment and facilities, and expediting assistance.

(7) Subcontracting. To be weighted inversely proportional to the amount of subcontracting. Where 80% or more of the work is to be subcontracted use .03. The weighting should be increased proportionately to .12 where all the work is performed by the contractor's own forces.

12. SAACONS 52.0219-4509 SUBCONTRACTING WITH SMALL, SMALL DISADVANTAGED AND WOMEN-OWNED SMALL BUSINESSES (JAN 1996)

Contractors are cautioned that failure of any Contractor to comply in good faith with the Contract Clauses titled (1) Utilization of Small, Small Disadvantaged and Women-Owned Small Business Concerns or (2) Small, Small Disadvantaged and Women-Owned Small Business Subcontracting Plan, when applicable, will be a material breach of contract. In order to assist contractors in developing a source list of small, small disadvantaged and/or women-owned small business concerns you are encouraged to contact your minority contractor associates, the local Minority Business Development Agency and the appropriate General Business Service Centers in your Standard Metropolitan Statistical Area. Contractors may obtain addresses of these sources from:

Write: US Army Engineer District, Sacramento
ATTN: Contracting Division, Deputy for Small Business
1325 J Street, 8th Floor
Sacramento, California 95814-2922

Or Contact: Mr. John Szabo
Deputy for Small Business
Telephone: (916) 557-5202

13. DFARS 252.223-7006 PROHIBITION ON STORAGE AND DISPOSAL OF TOXIC AND HAZARDOUS MATERIALS (APR 1993)

(a) Definitions. As used in this clause--

(1) "Storage" means a non-transitory, semi-permanent or permanent holding, placement, or leaving of material. It does not include a temporary accumulation of a limited quantity of a material used in or a waste generated or resulting from authorized activities, such as servicing, maintenance, or repair of Department of Defense (DoD) items, equipment, or facilities.

(2) "Toxic or hazardous materials" means:

(i) Materials referred to in section 101(14) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 (42 U.S.C. 9601(14)) and materials designated under section 102 of CERCLA (42 U.S.C. 9602 (40 CFR Part 302);

(ii) Materials that are of an explosive, flammable, or pyrotechnic nature; or

(iii) Materials otherwise identified by the Secretary of Defense as specified in DoD regulations.

(b) In accordance with 10 U.S.C. 2692, the Contractor is prohibited from storing or disposing of non-DoD-owned toxic or hazardous materials on a DoD installation, except to the extent authorized by a statutory exception to 10 U.S.C. 2692 or as authorized by the Secretary of Defense or his designee.

14. SAACONS 52.0223-4803 HAZARDOUS MATERIALS DELIVERED UNDER THIS CONTRACT (MAY 1993)

(a) If any hazardous materials will be delivered under this contract (see Section 00600, FAR 52.223-3, and DFARS 252.223-7001), the Material Safety Data Sheets (MSDS) for locally purchased, nonstandard stock hazardous material

will be submitted to the Corps of Engineers Contracting Officer or Contracting Officer's Representative. For all other materials, the MSDS will also be submitted to U.S. Army Environmental Hygiene Agency, ATTN: HSE-OI, Aberdeen Proving Grounds MD 21010.

(b) Hazardous material is defined in Federal Standard No. 313, sold by the General Services Administration Specifications Unit (3FBP-W), 7th & D Streets, SW, Washington DC 20407.

15. SAACONS 52.0228-4502 MINIMUM INSURANCE REQUIRED (MAY 1993)

The contract clause, FAR 52.228-5, applies to this contract even if the work or any portion of the work is not performed on a Government installation. In accordance with FAR 52.228-5 and FAR 28.307-2, the contractor shall procure and thereafter maintain during the entire period of this performance under this contract the following minimum insurance.

TYPE	AMOUNT
Worker's Compensation and Employer's Liability	Comply with Federal and State worker's comp and occupational disease statutes. Employer's liability of at least \$100,000
General Liability (Comprehensive)	Bodily injury liability of at least \$500,000 per occurrence.
Automobile Liability (Comprehensive): Bodily Injury & Property Damage	At least \$200,000 per person and \$500,000 per occurrence. At least \$20,000 per occurrence.
Longshoremen's and Harbor Worker's Compensation (When applicable by location of contract performance)	Coverage complying with applicable Federal statute (33 USC 901 et seq).

16. EFARS 52.231-5000 EQUIPMENT OWNERSHIP AND OPERATING
EXPENSE SCHEDULE (MAR 1995)--EFARS

(a) This statement shall become operative only for negotiated contracts where cost or pricing data is requested, and for modifications to sealed bid or negotiated contracts where cost or pricing data is requested. This clause does not apply to terminations. See 52.249-5000, Basis for Settlement of Proposals, and FAR Part 49.

(b) Allowable cost for CONSTRUCTION and marine plant and equipment in sound workable condition owned or controlled and furnished by a contractor or subcontractor at any tier shall be based on actual cost data for each piece of equipment or groups of similar serial and series for which the Government can determine both ownership and operating costs from the contractor's accounting records. When both ownership and operating costs cannot be determined for any piece of equipment or groups of similar serial or series equipment from the contractor's accounting records, costs for that equipment shall be based upon the applicable provisions of EP 1110-1-8, CONSTRUCTION Equipment Ownership and Operating Expense Schedule, Region VII. Working conditions shall be considered to be average for determining equipment rates using the schedule unless specified otherwise by the contracting officer. For equipment not

included in the schedule, rates for comparable pieces of equipment may be used or a rate may be developed using the formula provided in the schedule. For forward pricing, the schedule in effect at the time of negotiations shall apply. For retroactive pricing, the schedule in effect at the time the work was performed shall apply.

(c) Equipment rental costs are allowable, subject to the provisions of FAR 31.105(d)(ii) and FAR 31.205-36. Rates for equipment rented from an organization under common control, lease-purchase arrangements, and sale-leaseback arrangements, will be determined using the schedule, except that actual rates will be used for equipment leased from an organization under common control that has an established practice of leasing the same or similar equipment to unaffiliated lessees.

(d) When actual equipment costs are proposed and the total amount of the pricing action exceeds the small purchase threshold, the contracting officer shall request the contractor to submit either certified cost or pricing data, or partial/limited data, as appropriate. The data shall be submitted on Standard Form 1411, Contract Pricing Proposal Cover Sheet.

NOTE: See also, Specification Section 01500. A copy of the EP 1110-1-8 is available for review in the Corps of Engineers, Sacramento District Office, 1325 J Street, Library, 8th floor, telephone (916) 557-6657. Copies are available for a nominal charge from the Government Printing Office, telephone (202) 783-3238.

17. FAR 52.232-27

PROMPT PAYMENT FOR CONSTRUCTION CONTRACTS
(MAR 1994)

Notwithstanding any other payment terms in this contract, the Government will make invoice payments and contract financing payments under the terms and conditions specified in this clause. Payment shall be considered as being made on the day a check is dated or an electronic funds transfer is made. Definitions of pertinent terms are set forth in 32.902. All days referred to in this clause are calendar days, unless otherwise specified.

(a) Invoice Payments.

(1) For purposes of this clause, there are several types of invoice payments which may occur under this contract, as follows:

(i) Progress payments, if provided for elsewhere in this contract, based on Contracting Officer approval of the estimated amount and value of work or services performed, including payments for reaching milestones in any project:

(A) The due date for making such payments shall be 25 days after receipt of the payment request by the designated billing office. However, if the designated billing office fails to annotate the payment request with the actual date of receipt, the payment due date shall be deemed to be the 25th day after the date the Contractor's payment request is dated, provided a proper payment request is received and there is no disagreement over quantity, quality, or Contractor compliance with contract requirements.

(B) The due date for payment of any amounts retained by the Contracting Officer in accordance with the clause at 52.232-5, Payments Under Fixed-Price CONSTRUCTION Contracts, shall be as specified in the contract or, if not specified, 30 days after approval for release to the Contractor by the Contracting Officer.

(ii) Final payments based on completion and acceptance of all work and presentation of release of all claims against the Government arising by virtue of the contract, and payments for partial deliveries that have been accepted by the Government (e.g., each separate building, public work, or other division of the contract for which the price is stated separately in the contract):

(A) The due date for making such payments shall be either the 30th day after receipt by the designated billing office of a proper invoice from the

Contractor, or the 30th day after Government acceptance of the work or services completed by the Contractor, whichever is later. However, if the designated billing office fails to annotate the invoice with the date of actual receipt, the invoice payment due date shall be deemed to be the 30th day after the date the Contractor's invoice is dated, provided a proper invoice is received and there is no disagreement over quantity, quality, or Contractor compliance with contract requirements.

(B) On a final invoice where the payment amount is subject to contract settlement actions (e.g., release of claims), acceptance shall be deemed to have occurred on the effective date of the contract settlement.

(2) An invoice is the Contractor's bill or written request for payment under the contract for work or services performed under the contract. An invoice shall be prepared and submitted to the designated billing office. A proper invoice must include the items listed in subdivisions (a)(2)(i) through (a)(2)(ix) of this clause. If the invoice does not comply with these requirements, the Contractor will be notified of the defect within 7 days after receipt of the invoice at the designated billing office. Untimely notification will be taken into account in the computation of any interest penalty owed the Contractor in the manner described in subparagraph (a)(4) of this clause:

- (i) Name and address of the Contractor.
- (ii) Invoice date.
- (iii) Contract number or other authorization for work or services performed (including order number and contract line item number).
- (iv) Description of work or services performed.
- (v) Delivery and payment terms (e.g., prompt payment discount terms).
- (vi) Name and address of Contractor official to whom payment is to be sent (must be the same as that in the contract or in a proper notice of assignment).
- (vii) Name (where practicable), title, phone number, and mailing address of person to be notified in event of a defective invoice.
- (viii) For payments described in subdivision (a)(1)(i) of this clause, substantiation of the amounts requested and certification in accordance with the requirements of the clause at 52.232-5, Payments Under Fixed-Price CONSTRUCTION Contracts.
- (ix) Any other information or documentation required by the contract.

(3) An interest penalty shall be paid automatically by the designated payment office, without request from the Contractor, if payment is not made by the due date and the conditions listed in subdivisions (a)(3)(i) through (a)(3)(iii) of this clause are met, if applicable.

- (i) A proper invoice was received by the designated billing office.
- (ii) A receiving report or other Government documentation authorizing payment was processed and there was no disagreement over quantity, quality, Contractor compliance with any contract term or condition, or requested progress payment amount.
- (iii) In the case of a final invoice for any balance of funds due the Contractor for work or services performed, the amount was not subject to further contract settlement actions between the Government and the Contractor.

(4) The interest penalty shall be at the rate established by the Secretary of the Treasury under section 12 of the Contract Disputes Act of 1978 (41 U.S.C. 611) that is in effect on the day after the due date, except where the interest penalty is prescribed by other governmental authority. This rate is referred to as the "Renegotiation Board Interest Rate," and it is published in the Federal Register semiannually on or about January 1 and July 1. The interest penalty shall accrue daily on the invoice payment amount approved by the Government and be compounded in 30-day increments inclusive from the first day after the due date through the payment date. That is, interest accrued at the end of any 30-day period will be added to the approved invoice payment amount and be subject to interest penalties if not paid in the

succeeding 30-day period. If the designated billing office failed to notify the Contractor of a defective invoice within the periods prescribed in subparagraph (a)(2) of this clause, then the due date on the corrected invoice will be adjusted by subtracting the number of days taken beyond the prescribed notification of defects period. Any interest penalty owed the Contractor will be based on this adjusted due date. Adjustments will be made by the designated payment office for errors in calculating interest penalties, if requested by the Contractor.

(i) For the sole purpose of computing an interest penalty that might be due the Contractor for payments described in subdivision (a)(1)(ii) of this clause, Government acceptance or approval shall be deemed to have occurred constructively on the 7th day after the Contractor has completed the work or services in accordance with the terms and conditions of the contract. In the event that actual acceptance or approval occurs within the constructive acceptance or approval period, the determination of an interest penalty shall be based on the actual date of acceptance or approval. Constructive acceptance or constructive approval requirements do not apply if there is a disagreement over quantity, quality, or Contractor compliance with a contract provision. These requirements also do not compel Government officials to accept work or services, approve Contractor estimates, perform contract administration functions, or make payment prior to fulfilling their responsibilities.

(ii) The following periods of time will not be included in the determination of an interest penalty:

(A) The period taken to notify the Contractor of defects in invoices submitted to the Government, but this may not exceed 7 days.

(B) The period between the defects notice and resubmission of the corrected invoice by the Contractor.

(iii) Interest penalties will not continue to accrue after the filing of a claim for such penalties under the clause at 52.233-1, Disputes, or for more than 1 year. Interest penalties of less than \$1.00 need not be paid.

(iv) Interest penalties are not required on payment delays due to disagreement between the Government and Contractor over the payment amount or other issues involving contract compliance, or on amounts temporarily withheld or retained in accordance with the terms of the contract. Claims involving disputes, and any interest that may be payable, will be resolved in accordance with the clause at 52.233-1, Disputes.

(5) An interest penalty shall also be paid automatically by the designated payment office, without request from the Contractor, if a discount for prompt payment is taken improperly. The interest penalty will be calculated on the amount of discount taken for the period beginning with the first day after the end of the discount period through the date when the Contractor is paid.

(6) If this contract was awarded on or after October 1, 1989, a penalty amount, calculated in accordance with regulations issued by the Office of Management and Budget, shall be paid in addition to the interest penalty amount if the Contractor--

(i) Is owed an interest penalty;

(ii) Is not paid the interest penalty within 10 days after the date the invoice amount is paid; and

(iii) Makes a written demand, not later than 40 days after the date the invoice amount is paid, that the agency pay such a penalty.

(b) Contract Financing Payments.

(1) For purposes of this clause, if applicable, "contract financing payment" means a Government disbursement of monies to a Contractor under a contract clause or other authorization prior to acceptance of supplies or services by the Government, other than progress payments based on estimates of amount and value of work performed. Contract financing payments include advance payments and interim payments under cost-type contracts.

(2) If this contract provides for contract financing, requests for payment shall be submitted to the designated billing office as specified in this contract or as directed by the Contracting Officer. Contract financing payments shall be made on the 30th day after receipt of a proper contract financing request by the designated billing office. In the event that an audit or other review of a specific financing request is required to ensure compliance with the terms and conditions of the contract, the designated payment office is not compelled to make payment by the due date specified. For advance payments, loans, or other arrangements that do not involve recurrent submissions of contract financing requests, payment shall be made in accordance with the corresponding contract terms or as directed by the Contracting Officer. Contract financing payments shall not be assessed an interest penalty for payment delays.

(c) The Contractor shall include in each subcontract for property or services (including a material supplier) for the purpose of performing this contract the following:

(1) A payment clause which obligates the Contractor to pay the subcontractor for satisfactory performance under its subcontract not later than 7 days from receipt of payment out of such amounts as are paid to the Contractor under this contract.

(2) An interest penalty clause which obligates the Contractor to pay to the subcontractor an interest penalty for each payment not made in accordance with the payment clause--

(i) For the period beginning on the day after the required payment date and ending on the date on which payment of the amount due is made; and

(ii) Computed at the rate of interest established by the Secretary of the Treasury, and published in the Federal Register, for interest payments under section 12 of the Contract Disputes Act of 1978 (41 U.S.C. 611) in effect at the time the Contractor accrues the obligation to pay an interest penalty.

(3) A clause requiring each subcontractor to include a payment clause and an interest penalty clause conforming to the standards set forth in subparagraphs (c)(1) and (c)(2) of this clause in each of its subcontracts, and to require each of its subcontractors to include such clauses in their subcontracts with each lower-tier subcontractor or supplier.

(d) The clauses required by paragraph (c) of this clause shall not be construed to impair the right of Contractor or a subcontractor at any tier to negotiate, and to include in their subcontract, provisions which--

(1) Permit the Contractor or a subcontractor to retain (without cause) a specified percentage of each progress payment otherwise due to a subcontractor for satisfactory performance under the subcontract without incurring any obligation to pay a late payment interest penalty, in accordance with terms and conditions agreed to by the parties to the subcontract, giving such recognition as the parties deem appropriate to the ability of a subcontractor to furnish a performance bond and a payment bond;

(2) Permit the Contractor or subcontractor to make a determination that part or all of the subcontractor's request for payment may be withheld in accordance with the subcontract agreement; and

(3) Permit such withholding without incurring any obligation to pay a late payment penalty if--

(i) A notice conforming to the standards of paragraph (g) of this clause has been previously furnished to the subcontractor; and

(ii) A copy of any notice issued by a Contractor pursuant to subdivision (d)(3)(i) of this clause has been furnished to the Contracting Officer.

(e) If a Contractor, after making a request for payment to the Government but before making a payment to a subcontractor for the subcontractor's performance covered by the payment request, discovers that all or a portion of the payment otherwise due such subcontractor is subject to withholding from the subcontractor in accordance with the subcontract agreement, then the Contractor shall--

(1) Furnish to the subcontractor a notice conforming to the standards of paragraph (g) of this clause as soon as practicable upon ascertaining the cause giving rise to a withholding, but prior to the due date for subcontractor payment;

(2) Furnish to the Contracting Officer, as soon as practicable, a copy of the notice furnished to the subcontractor pursuant to subparagraph (e)(1) of this clause;

(3) Reduce the subcontractor's progress payment by an amount not to exceed the amount specified in the notice of withholding furnished under subparagraph (e)(1) of this clause;

(4) Pay the subcontractor as soon as practicable after the correction of the identified subcontract performance deficiency, and--

(i) Make such payment within--

(A) Seven days after correction of the identified subcontract performance deficiency (unless the funds therefor must be recovered from the Government because of a reduction under subdivision (e)(5)(i)) of this clause; or

(B) Seven days after the Contractor recovers such funds from the Government; or

(ii) Incur an obligation to pay a late payment interest penalty computed at the rate of interest established by the Secretary of the Treasury, and published in the Federal Register, for interest payments under section 12 of the Contracts Disputes Act of 1978 (41 U.S.C. 611) in effect at the time the Contractor accrues the obligation to pay an interest penalty;

(5) Notify the Contracting Officer upon--

(i) Reduction of the amount of any subsequent certified application for payment; or

(ii) Payment to the subcontractor of any withheld amounts of a progress payment, specifying--

(A) The amounts withheld under subparagraph (e)(1) of this clause; and

(B) The dates that such withholding began and ended; and

(6) Be obligated to pay to the Government an amount equal to interest on the withheld payments (computed in the manner provided in 31 U.S.C. 3903(c)(1)), from the 8th day after receipt of the withheld amounts from the Government until--

(i) The day the identified subcontractor performance deficiency is corrected; or

(ii) The date that any subsequent payment is reduced under subdivision (e)(5)(i) of this clause.

(f)(1) If a Contractor, after making payment to a first-tier subcontractor, receives from a supplier or subcontractor of the first-tier subcontractor (hereafter referred to as a "second-tier subcontractor") a written notice in accordance with section 2 of the Act of August 24, 1935 (40 U.S.C. 270b, Miller Act), asserting a deficiency in such first-tier subcontractor's performance under the contract for which the Contractor may be ultimately liable, and the Contractor determines that all or a portion of future payments otherwise due such first-tier subcontractor is subject to withholding in accordance with the subcontract agreement, then the Contractor may, without incurring an obligation to pay an interest penalty under subparagraph (e)(6) of this clause--

(i) Furnish to the first-tier subcontractor a notice conforming to the standards of paragraph (g) of this clause as soon as practicable upon making such determination; and

(ii) Withhold from the first-tier subcontractor's next available progress payment or payments an amount not to exceed the amount specified in the notice of withholding furnished under subdivision (f)(1)(i) of this clause.

(2) As soon as practicable, but not later than 7 days after receipt of satisfactory written notification that the identified subcontract performance deficiency has been corrected, the Contractor shall pay the amount withheld under subdivision (f)(1)(ii) of this clause to such first-tier subcontractor,

or shall incur an obligation to pay a late payment interest penalty to such first-tier subcontractor computed at the rate of interest established by the Secretary of the Treasury, and published in the Federal Register, for interest payments under section 12 of the Contracts Disputes Act of 1978 (41 U.S.C. 611) in effect at the time the Contractor accrues the obligation to pay an interest penalty.

(g) A written notice of any withholding shall be issued to a subcontractor (with a copy to the Contracting Officer of any such notice issued by the Contractor), specifying--

(1) The amount to be withheld;

(2) The specific causes for the withholding under the terms of the subcontract; and

(3) The remedial actions to be taken by the subcontractor in order to receive payment of the amounts withheld.

(h) The Contractor may not request payment from the Government of any amount withheld or retained in accordance with paragraph (d) of this clause until such time as the Contractor has determined and certified to the Contracting Officer that the subcontractor is entitled to the payment of such amount.

(i) A dispute between the Contractor and subcontractor relating to the amount or entitlement of a subcontractor to a payment or a late payment interest penalty under a clause included in the subcontract pursuant to paragraph (c) of this clause does not constitute a dispute to which the United States is a party. The United States may not be interpleaded in any judicial or administrative proceeding involving such a dispute.

(j) Except as provided in paragraph (I) of this clause, this clause shall not limit or impair any contractual, administrative, or judicial remedies otherwise available to the Contractor or a subcontractor in the event of a dispute involving late payment or nonpayment by the Contractor or deficient subcontract performance or nonperformance by a subcontractor.

(k) The Contractor's obligation to pay an interest penalty to a subcontractor pursuant to the clauses included in a subcontract under paragraph (c) of this clause shall not be construed to be an obligation of the United States for such interest penalty. A cost reimbursement claim may not include any amount for reimbursement of such interest penalty.

18. DFARS 252.232-7006 REDUCTION OR SUSPENSION OF CONTRACT PAYMENTS
UPON FINDING OF FRAUD
(AUG 1992)

(a) 10 U.S.C. 2307(e) permits the head of the agency to reduce or suspend further payments upon a written determination by the agency head that substantial evidence exists that the Contractor's request for advance, partial, or progress payments is based on fraud. The provisions of 10 U.S.C. 2307(e) are in addition to any other rights or remedies provided the Government by law or under contract.

(b) Actions taken by the Government in accordance with 10 U.S.C. 2307(e) shall not constitute an excusable delay under the Default clause of this contract or otherwise relieve the Contractor of its obligations to perform under this contract.

19. FAR 52.236-1 PERFORMANCE OF WORK BY THE CONTRACTOR
(APR 1984)

The Contractor shall perform on the site, and with its own organization, work equivalent to at least twenty percent of the total amount of work to be performed under the contract. This percentage may be reduced by a supplemental agreement to this contract if, during performing the work, the

Contractor requests a reduction and the Contracting Officer determines that the reduction would be to the advantage of the Government.

20. FAR 52.236-4

PHYSICAL DATA (APR 1984)

Data and information furnished or referred to below is for the Contractor's information. The Government shall not be responsible for any interpretation of or conclusion drawn from the data or information by the Contractor.

(a) The indications of physical conditions on the drawings and in the specifications are the result of site investigations by the Government.

(b) Weather conditions: The Contractor shall satisfy himself/herself as to the hazards likely to arise from weather conditions. Complete weather records and reports may be obtained from any U.S. Weather Bureau Office.

(c) Transportation Facilities: The Contractor shall make his/her own investigation of the conditions of existing public and private roads and of clearances, restrictions, bridge load limits and other limitations affecting transportation and ingress and egress at the job site. The unavailability of transportation facilities or limitations thereon shall not become a basis for claims against the Government or extension of time for completion of the work.

21. DFARS 252.236-7001

CONTRACT DRAWINGS, MAPS, AND SPECIFICATIONS
(DEC 1991)

(a) The Government--

(1) Will provide the Contractor, without charge, one set of large-scale contract drawings and specifications except publications incorporated into the technical provisions by reference;

(2) Will furnish additional sets on request, for the cost of reproduction; and

(3) May, at its option, furnish the Contractor one set of reproduces, or half-size drawings, in lieu of the drawings in paragraph (a)(1) of this clause.

(b) The Contractor shall--

(1) Check all drawings furnished immediately upon receipt;

(2) Compare all drawings and verify the figures before laying out the work;

(3) Promptly notify the Contracting Officer of any discrepancies; and

(4) Be responsible for any errors which might have been avoided by complying with this paragraph (b).

(c) Large scale drawings shall, in general, govern small scale drawings. Figures marked on drawings shall, in general, be followed in preference to scale measurements.

(d) Omissions from the drawings or specifications or the misdescription of details of work which are manifestly necessary to carry out the intent of the drawings and specifications, or which are customarily performed, shall not relieve the Contractor from performing such omitted or misdescribed details of the work, but shall be performed as if fully and correctly set forth and described in the drawings and specifications.

(e) The work shall conform to the specifications and the contract drawings identified on the following index of drawings:

Drawing File No.180-25-770

Sheet No.	Description	Rev. No.
1	TITLE SHEET	
2	SCHEDULE OF DRAWINGS	
3	LOCATION & VICINITY MAPS	
4	SHEET INDEX	
5	TOPOGRAPHIC	
6	TOPOGRAPHIC	
7	TOPOGRAPHIC	
8	TOPOGRAPHIC	
9	TOPOGRAPHIC	
10	LOG OF EXPLORATIONS	
11	LOG OF EXPLORATIONS	
12	DEMOLITION PLAN AND LEGEND & ABBREVIATIONS	
13	DEMOLITION DETAILS	
14	OVERALL SITE PLAN	
15	SITE PLAN	
16	GRADING PLAN	
17	UTILITY PLAN	
18	PLAN & PROFILE	
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22	SITE DETAILS	
23	SITE DETAILS	
24	UTILITY DETAILS	
25	JOINT PLAN	
26	FLOOR PLAN, PAINT SCHEDULE, SYMBOLS, LEGEND & ABBREVIATIONS	
27	EXTERIOR BUILDING ELEVATIONS	
28	LONGITUDINAL REINFORCING SECTIONS	
29	WALL SECTION & DETAILS	
30	WALL SECTIONS	
31	HEAD WALL PLAN & ELEVATION	
32	CANOPY SECTIONS	
33	PLAN COVER PLATES, ENTRIES, MISC. DETAILS	
34	STAIR PLAN, SECTIONS & MISC. DETAILS	
35	ROOF PLAN & MISC. DETAILS	
36	WINCH CAR/TRACK PLAN & DETAILS RAIL DETAILS	
37	HINGER RAIL PLAN & DETAILS	
38	HINGER RAIL DETAILS	
39	MISC. DETAILS	
40	MISC. DETAILS	
41	DOOR SCHEDULE, ELEVATIONS & MISC. DETAILS	
42	REMOVABLE RAIL DETAILS	
43	DESIGN CRITERIA, SCHEDULES & LEGEND	
44	FOOTING & FOUNDATION PLAN	
45	ROOF FRAMING PLAN	
46	HEAD WALL ELEVATION & PARTIAL REAR WALL ELEVATION	
47	SIDE WALL ELEVATION & MECHANICAL ROOM ELEVATIONS	
48	WALL SECTIONS	
49	LONGITUDINAL REINFORCING SECTIONS	
50	LONGITUDINAL REINFORCING SECTIONS	
51	TRANSVERSE REINFORCING SECTIONS	
52	BUILDING SECTIONS	
53	FOOTING & FOUNDATION DETAILS	
54	FOOTING & FOUNDATION DETAILS	
55	BLAST DOOR ELEVATION, PLAN & SECTION	
56	BLAST DOOR DETAILS	
57	RETAINING WALL ELEVATIONS & SECTION	

58 MECHANICAL FLOOR PLAN
 59 MECHANICAL ROOM FLOOR PLAN
 60 EXISTING STEAM LINE DEMOLITION PLAN
 61 NEW STEAM LINE LOCATION PLAN
 62 PIPING SCHEMATIC / EQUIPMENT LIST
 63 CONTROL SHEET SNOW MELTING SYSTEM
 64 CONTROL SHEET AIR HANDLING UNIT CONTROLS
 65 CONTROL SHEET BACK PANEL FOR HVAC SYSTEM
 66 INTERIOR DOOR LAYOUT FOR HVAC SYSTEM
 67 SNOW MELTING SYSTEM
 68 MECHANICAL DETAILS
 69 MECHANICAL DETAILS
 70 STEAM LINE PROFILES
 71 SYMBOL LIST, FIXTURE SCHEDULE & ABBREVIATIONS
 72 ELECTRICAL SITE PLAN
 73 SITE PLAN DETAILS
 74 SINGLE LINE DIAGRAM AND PANEL SCHEDULES
 75 POWER, LIGHTING & MISCELLANEOUS SYSTEMS
 76 GROUNDING & LIGHTING PROTECTION PLAN
 77 MISC. MIXED DETAILS
 78 ELECTRICAL TELEPHONE CABLE WIRING SCHEDULE AND AUXILIARY SYSTEM
 DETAILS

STANDARD DRAWINGS

(Attached to SPECIFICATION SECTION: GENERAL REQUIREMENTS)

Project Sign	150-52-1162
Sign Details	150-25-1232
Safety Sign	80-25-707
Hard Hat Sign	80-25-774

(Attached to SPECIFICATION SECTION: ELECTRICAL WORK, INTERIOR)

Dwg No. 40-06-04 Sheets 31, 44, 56, 60 & 65.

22. SAACONS 52.0236-4801 SALVAGE AND SCRAP GOVERNMENT PROPERTY
(OCT 1993)

(a) "Government property" means all property owned by or leased to the Government or acquired by the Government under the terms of the contract. It includes both Government-furnished property and contractor-acquired property.

(b) "Salvage" means Government property in possession of a contractor, including subcontractors, that, because of its worn, damaged, deteriorated, or incomplete condition or specialized nature, has no reasonable prospect of sale or use as serviceable property without major repairs, but has some value in excess of its scrap value.

(c) "Scrap" means Government personal property that has no value except for its basic material content.

(d) In accordance with FAR 45.505-8 the Contractor shall maintain records of all scrap and salvage generated from this contract. The Contractor's records shall contain the following information:

- (1) Contract Number
- (2) Description of salvageable items or classification (material content) of scrap
- (3) Quantity on hand

(e) The Contractor shall provide final accounting and disposition recommendations of all Government property not consumed in performing this contract or delivered to the Government including salvage and scrap. The Government will review the Contractor's records and shall cause correction if the Government disagrees with the classification of items as salvage or scrap. The Contractor shall dispose of the items as directed by the Contracting Officer. Items designated as scrap (agreed to by the Contracting Officer) shall be retained by the Contractor; its disposition shall be the responsibility of the Contractor. See Specification Section 01500, paragraph entitled "Scrap Material". Items designated as salvageable items (agreed to by the Contracting Officer) shall be turned over to the Government.

23. SAACONS 52.0236-4581 AVAILABILITY OF UTILITIES SERVICES
(APR 1992)

All reasonably required amounts of water, electricity, and other utilities essential to contract performance will be made available to the contractor at no cost to the contractor from existing systems, outlets and supplies. All temporary connections, outlets and distribution lines, as may be required, shall be installed, maintained and removed by the Contractor at Contractor's expense; removal shall be before final acceptance of the work by the Government. The Contractor shall carefully conserve any utilities furnished without charge.

24. FAR 52.245-3 IDENTIFICATION OF GOVERNMENT-FURNISHED PROPERTY
(APR 1984)

(a) The Government will furnish to the Contractor the property identified in the Schedule to be incorporated or installed into the work or used in performing the contract. The listed property will be furnished f.o.b. railroad cars at the place specified in the contract Schedule or f.o.b. truck at the project site. The Contractor is required to accept delivery, pay any demurrage or detention charges, and unload and transport the property to the job site at its own expense. When the property is delivered, the Contractor shall verify its quantity and condition and acknowledge receipt in writing to the Contracting Officer. The Contractor shall also report in writing to the Contracting Officer within 24 hours of delivery any damage to or shortage of the property as received. All such property shall be installed or incorporated into the work at the expense of the Contractor, unless otherwise indicated in this contract.

(b) Each item of property to be furnished under this clause shall be identified in the Schedule by quantity, item, and description.
List of Government-Furnished Property:

<u>ITEM DESCRIPTION</u>	<u>VALUE OF ITEM</u>
SECURITY HASPS	\$460

END OF SECTION

ATTACHMENTS

ATTACHMENTS

1. GENERAL WAGE DECISION
2. DD FORM 2051, APPLICATION FOR COMMERCIAL AND GOVERNMENT ENTITY (CAGE) CODE - SEE SECTION 00100, DFARS 252.204-7001. COMPLETE SECTION B, BLOCKS 1 THROUGH 10, OF THE DD FORM 2051 AND RETURN WITH BID/COST PROPOSAL IF YOU DO NOT ALREADY HAVE A CAGE CODE.

IF YOU HAVE BEEN AWARDED A DOD CONTRACT WITHIN THE PAST SEVERAL YEARS, THE OFFICE THAT MADE THE AWARD WILL PROBABLY HAVE YOUR CAGE CODE NUMBER IN THEIR DATA BASE. (SACRAMENTO DISTRICT WILL NOT HAVE INFORMATION ON LOS ANGELES DISTRICT AWARDS AND VICE VERSA.) IF YOU DO NOT KNOW YOUR CAGE CODE NUMBER, SUBMIT THE DD FORM 2051 WITH YOUR BID/PROPOSAL. PLEASE DO NOT SEND THE DD FORM 2051 AHEAD OF TIME. BE SURE THAT YOU USE A STREET ADDRESS FOR YOUR FIRM, NOT A POST OFFICE BOX.

DO NOT UNDER ANY CIRCUMSTANCES DELAY SUBMITTING YOUR BID OR PROPOSAL WHILE ATTEMPTING TO OBTAIN A CAGE CODE NUMBER OR INFORMATION ON HOW TO COMPLETE THE DD FORM 2051. FAILURE TO FURNISH A CAGE CODE NUMBER OR THE FORM WILL NOT RENDER YOUR BID/PROPOSAL NONRESPONSIVE.

IN ORDER TO FILL IN THE STANDARD INDUSTRIAL CLASSIFICATION (SIC) NUMBER AS REQUIRED BY THE DD FORM 2051, YOU WILL FIND THE SIC CODE FOR THIS SOLICITATION IN SECTION 00600, FAR 52.219-1. TO LIST OTHER SIC CODES YOUR FIRM IS ALSO IN THE BUSINESS TO PROVIDE, THE STANDARD INDUSTRIAL CLASSIFICATION MANUAL IS SOLD BY THE NATIONAL TECHNICAL INFORMATION SERVICE, 5285 PORT ROYAL ROAD, SPRINGFIELD, VIRGINIA 22161. THE ORDER NUMBER IS PB 87-100012.

3. PREAWARD SURVEY - SEE SECTION 00100, SAACONS 52.0209-4501. THE PREAWARD SURVEY IS ATTACHED FOR INFORMATION PURPOSES ONLY; IT WILL BE REQUIRED ONLY FROM THE LOW BIDDER AFTER BID OPENING IF THE LOW BIDDER HAS NOT HAD A CONTRACT WITH THE SACRAMENTO DISTRICT, CORPS OF ENGINEERS, IN THE LAST TWELVE- MONTH PERIOD. IT IS NOT REQUIRED AS PART OF THE BID PACKAGE.
4. SAMPLE SUBCONTRACTING PLAN - SEE SECTION 00100, SAACONS 52.0219-4581; SECTION 00700, FAR 52.219-9; SECTION 00800, SAACONS 52.0219-4509. THE SAMPLE SUBCONTRACTING PLAN IS ATTACHED FOR INFORMATION PURPOSES ONLY. A SUBCONTRACTING PLAN WILL BE REQUIRED ONLY FROM THE LOW BIDDER IF THE LOW BIDDER IS A LARGE BUSINESS AND THE LOW BID IS OVER \$1 MILLION. A SUBCONTRACTING PLAN IS NOT REQUIRED FROM SMALL BUSINESSES. THE SUBCONTRACTING PLAN IS NOT REQUIRED FROM THE LOW BIDDER UNTIL AFTER THE BID OPENING; IT IS NOT REQUIRED AS PART OF THE BID PACKAGE.

GENERAL DECISION UT970034

UT34

Superseded General Decision No. UT960034

State: Utah

Construction Type:
BUILDING

County(ies):
WEBER

BUILDING CONSTRUCTION PROJECTS (does not include residential construction consisting of single family homes and apartments up to and including 4 stories)

Modification Number	Publication Date
0	02/14/1997
1	04/11/1997

COUNTY(ies):
WEBER

ASBE0069C 08/01/1995		
	Rates	Fringes
ASBESTOS WORKERS (Both the Insulation and Abatement involving Mechanical Surfaces)	19.64	6.30

SCOPE OF WORK:

Includes application of all insulating materials, protective coverings, coatings and finishings to all types of mechanical systems.

BOIL0182D 10/01/1994		
	Rates	Fringes
BOILERMAKERS	18.48	8.39

* CARP0722A 10/29/1995		
	Rates	Fringes
MILLWRIGHTS	19.83	3.25

ELEC0354I 06/01/1994		
	Rates	Fringes
ELECTRICIANS (Includes Low Voltage, Fiberoptic and Fire Alarm Installation)	18.14	3%+3.75

IRON0027F 07/01/1995		
	Rates	Fringes
IRONWORKERS	15.67	5.46

LABO0295F 10/01/1994		
	Rates	Fringes
LABORERS:		
Common	9.25	2.69

* PLUM0019D 01/01/1997		
	Rates	Fringes
PLUMBERS & PIPEFITTERS (including HVAC duct work)	19.38	5.18

SFUT0669A 01/01/1995		
	Rates	Fringes
SPRINKLER FITTERS	16.70	6.23

* SHEE0312F 01/01/1997		
	Rates	Fringes
SHEET METAL WORKERS (Including Architect/Roofing and HVAC		

Duct Work)	19.61	5.11

SUUT1006A 09/07/1994		
	Rates	Fringes
CARPENTERS (including drywall hanging)	12.68	2.85
CEMENT MASONS	12.95	2.50
POWER EQUIPMENT OPERATORS:		
Backhoe	10.00	
Crane	15.00	

WELDERS - Receive rate prescribed for craft performing operation
to which welding is incidental.

=====

Unlisted classifications needed for work not included within
the scope of the classifications listed may be added after
award only as provided in the labor standards contract clauses
(29 CFR 5.5(a)(1)(v)).

In the listing above, the "SU" designation means that rates
listed under that identifier do not reflect collectively
bargained wage and fringe benefit rates. Other designations
indicate unions whose rates have been determined to be
prevailing.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can
be:

- * an existing published wage determination
- * a survey underlying a wage determination
- * a Wage and Hour Division letter setting forth a
position on a wage determination matter
- * a conformance (additional classification and rate)
ruling

On survey related matters, initial contact, including requests
for summaries of surveys, should be with the Wage and Hour
Regional Office for the area in which the survey was conducted
because those Regional Offices have responsibility for the
Davis-Bacon survey program. If the response from this initial
contact is not satisfactory, then the process described in 2.)
and 3.) should be followed.

With regard to any other matter not yet ripe for the formal
process described here, initial contact should be with the Branch
of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U. S. Department of Labor
200 Constitution Avenue, N. W.
Washington, D. C. 20210

2.) If the answer to the question in 1.) is yes, then an
interested party (those affected by the action) can request

review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N. W.
Washington, D. C. 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U. S. Department of Labor
200 Constitution Avenue, N. W.
Washington, D. C. 20210

4.) All decisions by the Administrative Review Board are final.
END OF GENERAL DECISION

REQUEST FOR ASSIGNMENT OF A COMMERCIAL AND GOVERNMENT ENTITY (CAGE) CODE

(See Instructions on Reverse)

Form Approved
OMB No. 0704-0225
Expires May 31, 1990

SECTION A - TO BE COMPLETED BY INITIATOR

1. REQUESTING GOVERNMENT AGENCY / ACTIVITY

a. NAME Activity Code: 369		b. ADDRESS (Street, City, State and Zip Code) Corps of Engineers 1325 J Street, Rm 878 Sacramento, CA 95814-2922	
2. TYPE CODE REQUESTED (X one)		3. EXCEPTION CODES	
<input type="checkbox"/> a. TYPE A	<input type="checkbox"/> a. CAO		
<input checked="" type="checkbox"/> b. TYPE F	<input type="checkbox"/> b. ADP		

4. INITIATOR

a. TYPED NAME (Last, First, Middle Initial) MILLER, RONALD J.	b. OFFICE SYMBOL CESPK-CT	c. SIGNATURE 	d. TELEPHONE NO. (916) 557-5205
------------------------------------------------------------------	------------------------------	----------------------------------------------------------------------------------------------------	------------------------------------

SECTION B - TO BE COMPLETED BY FIRM TO BE CODED

1. FIRM

a. NAME (Include Branch of, Division of, etc.)	DO NOT USE A P.O. BOX ADDRESS!!!		
b. ADDRESS (Street, City, State and Zip Code)			
c. CAGE CODE (if previously assigned)			
2. IF FIRM PREVIOUSLY OPERATED UNDER OTHER NAME(S) OR OTHER ADDRESS(ES) SPECIFY THE PREVIOUS NAME(S) AND/OR ADDRESS(ES) (Use separate sheet of paper, if necessary)	3. PARENT COMPANY AND AFFILIATED FIRMS (X one, and complete as applicable)		
	<input type="checkbox"/> a. NONE		
	<input type="checkbox"/> b. CURRENTLY AFFILIATED WITH OTHER FIRMS (List name(s) and address(es) of such firms on a separate sheet of paper)		
	<input type="checkbox"/> c. PREVIOUSLY AFFILIATED WITH OTHER FIRMS (List name(s) and address(es) of such firms on a separate sheet of paper)		

4. PRIMARY BUSINESS CATEGORY (X one)

<input type="checkbox"/> a. MANUFACTURER	5. DISADVANTAGED SMALL BUSINESS STATUS (X one)	<input type="checkbox"/> a. APPROVED BY SMALL BUSINESS ADMINISTRATION (SBA) FOR SECTION 8(a) PROGRAM	6. NUMBER OF EMPLOYEES	
<input type="checkbox"/> b. DEALER/DISTRIBUTOR				
<input type="checkbox"/> c. CONSTRUCTION FIRM				
<input type="checkbox"/> d. SERVICE COMPANY				
<input type="checkbox"/> e. SALES OFFICE				
<input type="checkbox"/> f. OTHER (Specify)	<input type="checkbox"/> b. OTHER DISADVANTAGED SMALL BUSINESS FIRM	<input type="checkbox"/> c. NOT DISADVANTAGED SMALL BUSINESS FIRM	7. WOMAN OWNED BUSINESS (X one)	
			<input type="checkbox"/> a. YES	<input type="checkbox"/> b. NO
			8. STANDARD INDUSTRIAL CLASSIFICATION (SIC) CODE(S)	
			<input type="checkbox"/> a. PRIMARY	
			<input type="checkbox"/> b. OTHER (Specify)	

SOLICITATION NUMBER: DACA05-97-B-0082

CONTRACT SPECIALIST: LEVENSON-SNITZ

10. FIRM OFFICIAL

a. TYPED NAME (Last, First, Middle Initial)	b. DATE SIGNED (YYMMDD)	c. SIGNATURE	d. TELEPHONE NO.

INSTRUCTIONS FOR COMPLETING DD FORM 2051

GENERAL NOTE FOR PERSONNEL PREPARING OR PROCESSING THIS REPORT

Coding must be as indicated in the instructions. In cases where specific coding instructions are provided, reference must be made to the Department of Defense Manual for Standard Data Elements, DoD 5000.12-M. Noncompliance with either the coding instructions contained herein or those published in referenced manual will make the organization which fails to comply responsible for required concessions in data base communication.

SPECIFIC INSTRUCTIONS

SECTION A - TO BE COMPLETED BY THE INITIATING GOVERNMENT ACTIVITY	SECTION B - (Continued)
Item 1: Self-explanatory.	Item 4: Self-explanatory.
Item 2: Mark the type of code being requested. a. Type A - Manufacturers Code which is used in the Federal Catalog System to identify a certain facility at a specific location which is a possible source for the manufacture and/or design control of items cataloged by the Federal Government; or, b. Type F - Non-manufacturers Code which is required for identifying an organization/function in MILSCAP. These are assigned to contractors which are non-manufacturers or are manufacturers not qualifying for a Type A Code.	Item 5: A disadvantaged business firm is defined as a firm that is 51%, or more, owned, controlled, and operated by a person(s) who is socially and economically disadvantaged. "Controlled" is defined as exercising the power to make policy decisions. "Operated" is defined as actively involved in the day-to-day management of the firm. Item 6: Enter the number of employees. This number should include the employees of all affiliates. Item 7: A woman-owned business is defined as a firm that is 51%, or more, owned, controlled, and operated by a woman or women. "Controlled" and "Operated" are as defined in Item 5.
Item 3: If applicable, enter the exception DoD Activity Address Code for the Servicing Contract Administration Office (CAO) or ADP point.	Item 8: The SIC Code is a Government Index used to identify business activity and indicates the function (manufacturer, wholesaler, retailer, or service) and the line of business in which the company is engaged. If multiple SIC Codes, indicate the primary first, next important, etc.
Item 4: Self-explanatory.	
SECTION B - TO BE COMPLETED BY THE FIRM TO WHICH THE CODE WILL BE ASSIGNED	Items 9 and 10: Self-explanatory.
Items 1a and 1b: Self-explanatory.	NOTE: When any future changes are made to the coded facility; i.e., name change, location change, business sold or operations discontinued, etc., written notification stating the appropriate change should be sent to: <div style="text-align: right;"> Commander Defense Logistics Services Center ATTN: DLSC--SBB Federal Center 74 North Washington Battle Creek, MI 49017-3084 (616) 961-4358 FAX (616) 961-4265 </div>
Item 1c: If a CAGE Code (Type A or Type F) was previously assigned, enter it in this block.	
Item 2: Self-explanatory.	
Item 3: If a block other than "None" is marked, identify the Parent company by a (P) beside the firm name.	

PREAWARD SURVEY OF PROSPECTIVE CONTRACTORS
CONSTRUCTION CONTRACTS

It is the general policy of the Department of Defense that contracts shall be awarded only to contractors determined to be responsible in accordance with Part 9 of the Federal Acquisition Regulation (FAR).

No contract shall be awarded to any person or firm unless the Contracting Officer first makes an affirmative determination that the prospective contractor is responsible within the meaning of the FAR, Part 9.

Before making a determination of responsibility, the Contracting Officer shall have in his/her possession or obtain information sufficient to satisfy himself/herself that a prospective contractor currently meets the minimum FAR Part 9 standards.

In order to make the required determination and also to expedite the contract award, the following information must be submitted by the Contractor as directed (see Section 00100, SAACONS 52.0209-4501):

- A. COMPLETED CONTRACTOR EXPERIENCE DATA FORM WITH SUPPLEMENTAL SCHEDULES A-D (ATTACHED).
- B. LATEST FINANCIAL STATEMENTS. IF THE FINANCIAL STATEMENT IS MORE THAN 60 DAYS OLD, SUBMIT A CERTIFICATE STATING THAT THE FIRM'S FINANCIAL CONDITION IS SUBSTANTIALLY THE SAME, OR, IF NOT THE SAME, STATE THE CHANGES THAT HAVE TAKEN PLACE.
- C. PROVIDE LETTERS FROM BANKS OR OTHER FINANCIAL INSTITUTIONS WITH WHICH THE CONTRACTOR CONDUCTS BUSINESS. THE LETTERS SHOULD CONTAIN INFORMATION ABOUT YOUR FIRM'S ACCOUNTS, LOANS, LINES OF CREDIT, ETC., PROVIDING INFORMATION LEADING TO A DETERMINATION THAT YOUR FIRM IS "RESPONSIBLE" AS DEFINED IN THE FEDERAL ACQUISITION REGULATION, PART 9, "HAS THE FINANCIAL RESOURCES TO PERFORM THE CONTRACT OR THE ABILITY TO OBTAIN THEM". THE GOVT IS INTERESTED IN FINANCIAL STABILITY, TIMELY PAYMENTS, THE LENGTH AND NATURE OF THE RELATIONSHIP BETWEEN THE FIRM AND THE FINANCIAL INSTITUTION, ETC. WHICH REVEALS THE FIRM'S FINANCIAL ABILITY TO PERFORM THE CONTRACT. THE LETTERS SHOULD ALSO PROVIDE THE NAME AND TELEPHONE NUMBER OF THE BANK REPRESENTATIVE THE GOVERNMENT MAY CONTACT.

BE SURE TO INCLUDE IN YOUR PREAWARD SURVEY, INFORMATION ON ANY CONTRACTS YOU HAVE HAD WITH THE SACRAMENTO DISTRICT OR LOS ANGELES DISTRICT, CORPS OF ENGINEERS, WITHIN THE LAST 12 MONTHS.

THESE DOCUMENTS SHALL BE TREATED BY THE GOVERNMENT AS CONFIDENTIAL.

CONSTRUCTION CONTRACTOR EXPERIENCE DATA				DATE (Day, Month, Year)	
1. FIRM NAME			2. MAIN OFFICE ADDRESS (Street, City, State and Telephone)		
3. BRANCH OFFICES			4. SERVICES RENDERED <input type="checkbox"/> CONSTRUCTION <input type="checkbox"/> DESIGN <input type="checkbox"/> CONSULTANT		
5. ORGANIZATION <input type="checkbox"/> INDIVIDUAL <input type="checkbox"/> JOINT VENTURE <input type="checkbox"/> PARTNERSHIP <input type="checkbox"/> CORPORATION			6. DATE ORGANIZED		7. DATE INCORPORATED AND STATE
8. NAMES OF OFFICERS AND OTHER KEY PERSONNEL					
I - PRESENT PAYROLL PERSONNEL (List Number of Each Category Below)					
PARTNERS	OFFICERS	OTHER KEY	REMAINDER	TOTAL	SUBTOTAL PERMANENT MAXIMUM PERSONNEL AT ANY TIME
					DATE _____
II - EQUIPMENT OWNED			III - FINANCIAL DATA AS OF (Date) _____		
PRESENT VALUE (\$)		ACQUISITION COST (\$)		CURRENT ASSETS	CURRENT LIABILITIES
				NET WORTH	
IV - TOTAL CONTRACT VALUE OF CONSTRUCTION AND DEMOLITION IN PAST SIX YEARS EXCLUSIVE OF JOINT VENTURE				V - LARGEST JOB EVER CONTRACTED (If Other Than In Past Six Years)	
19	\$	LARGEST JOB IN PAST SIX YEARS		CONTRACT AMOUNT	DATE
19	\$	CONTRACT AMOUNT		DESCRIPTION	
19	\$	DATE			
19	\$	DESCRIPTION			
19	\$				
19	\$				
19	\$				
AVERAGE ANNUAL \$ INCOME		OWNER		OWNER	
VI - TYPE OF WORK IN WHICH FIRM SPECIALIZES					
VII - TYPE OF WORK AND ACCEPTABLE LOCATIONS FOR WHICH FIRM DESIRES TO BE CONSIDERED					
VIII - COST-REIMBURSEMENT TYPE CONTRACTS					
AGENCY OR OWNER		DATE		DESCRIPTION	
				AMOUNT	
TYPED NAME AND POSITION OR TITLE OF PERSON SIGNING				SIGNATURE	
NOTE: Use reverse side for remarks, explanations, or detailed description of items reported above.					

SCHEDULE ACONSTRUCTION CONTRACTOR EXPERIENCE DATA

EXISTING COMMITMENTS: (List below the construction projects your firm has under way on this date, including those on which you are presently low bidder but have not received an award.)

CONTRACT NUMBER AND AMOUNT	DESCRIPTION OF WORK	FOR WHOM PERFORMED*	PERCENT COMPLETE	PERCENT SUBLET
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* PROVIDE NAME OF ORGANIZATION, POINT OF CONTACT AND TELEPHONE NUMBER FOR CONTACT.

SCHEDULE BCONSTRUCTION CONTRACTOR EXPERIENCE DATA

EXPERIENCE DATA: (List below the principal construction projects your firm has completed within the past six (6) years.)

<u>CONTRACT NO.</u>	<u>AMOUNT</u>	<u>DESCRIPTION/LOCATION</u>	<u>CONTACT PERSON/PHONE NO</u>	<u>PERCENT SUBLET</u>
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SCHEDULE CCONSTRUCTION CONTRACTOR EXPERIENCE DATA

CONSTRUCTION AND/OR TECHNICAL EQUIPMENT: (List total equipment and facilities owned for performing the work and present status as to whether or not it is committed to existing contracts.)

<u>QUANTITY</u>	<u>DESCRIPTION</u>	<u>CONDITION</u>	<u>YEARS OF SERVICE</u>	<u>PRESENT STATUS</u>
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SCHEDULE D

CONSTRUCTION CONTRACTOR EXPERIENCE DATA

TO BE COMPLETED IF PROPOSED MILITARY CONSTRUCTION CONTRACT EXCEEDS \$1,000,000.

A. Each contract awarded within the preceding three-month period exceeding \$1,000,000 in value with brief description of the contract:

B. Each contract awarded within the preceding three-year period not already physically completed and exceeding \$5,000,000 in value with brief description of the contract:

- S A M P L E -

SUBCONTRACTING PLAN

SUBCONTRACTING PLAN SUBMITTED IN ACCORDANCE WITH PUBLIC LAW 95-507 (THE FOLLOWING FORMAT IS ESTABLISHED IN ACCORDANCE WITH FAR 52.219-9(d)(1) THROUGH (d)(11) AND INCLUDES THE REQUIRED STATUTORY ELEMENTS AS DESCRIBED IN FAR 19.704. IT ALSO INCLUDES ADDITIONAL REQUIREMENTS OF THE DFARS 219.704 AND AFARS 219.704. EVALUATION OF THE SUBCONTRACTING PLAN BY THE GOVERNMENT WILL BE AS PRESCRIBED IN FAR (AND ITS SUPPLEMENTS) 19.705.

DO NOT JUST ADDRESS THE FOLLOWING ISSUES IN SHORT; FOLLOW THE GUIDANCE OF FAR 52.219-9 IN ITS ENTIRETY. FOR EXAMPLE, PARAGRAPH 11 BELOW ASKS FOR A DISCUSSION OF RECORDS; THE PLAN SHOULD ADDRESS ALL RECORDS AS DESCRIBED IN FAR 52.219-9(d)(11)(i) THROUGH (vi).

IN ACCORDANCE WITH FAR 19.704 IF THE CONTRACT CONTAINS OPTIONS, THE CUMULATIVE VALUE OF THE BASIC CONTRACT AND ALL OPTIONS IS CONSIDERED IN DETERMINING WHETHER A SUBCONTRACTING PLAN IS NECESSARY. ONCE IT HAS BEEN DECIDED IF A PLAN IS NECESSARY, THE SUBCONTRACTING PLAN SHALL CONTAIN SEPARATE PARTS, ONE FOR THE BASIC CONTRACT AND ONE FOR EACH OPTION. *IN OTHER WORDS, IT IS NECESSARY TO ADDRESS PLANNED SUBCONTRACTING DOLLARS AND PERCENTAGES OF TOTAL TO BE AWARDED TO SMALL; SMALL, DISADVANTAGED; WOMEN-OWNED SMALL; HBCU/MIs; AND QUALIFIED NONPROFIT AGENCIES FOR THE BLIND AND OTHER SEVERELY DISABLED SEPARATELY FOR THE BASIC CONTRACT PERIOD AND EACH OPTION YEAR. THEREFORE, PARAGRAPHS 1 AND 2 BELOW MUST BE PREPARED SEPARATELY FOR THE BASE YEAR AND EACH OPTION YEAR. ALL OTHER PARTS OF THE SUBCONTRACTING PLAN ONLY NEED TO BE ADDRESSED ONCE.*

IF THE SUBCONTRACTING PLAN'S PROPOSED SUBCONTRACTING GOALS DO NOT MEET THE CORPS OF ENGINEERS' MINIMUM SUBCONTRACTING GOALS, THE SUBCONTRACTING PLAN MUST BE SUBMITTED WITH A FULL EXPLANATION OF THE REASONS FOR THE LESSER GOALS ESTABLISHED BY THE PLAN. A SMALL DISADVANTAGED BUSINESS GOAL OF LESS THAN FIVE PERCENT MUST BE APPROVED TWO LEVELS ABOVE THE CONTRACTING OFFICER (DFARS 219.705-4).

PROJECT TITLE: _____

RFP/IFB NO.: _____ CONTRACT NO.: _____

CONTRACTOR NAME: _____

DIVISION: _____

INDIVIDUAL COMPLETING THIS PLAN: _____

TELEPHONE NO.: _____

1. Goals, expressed in terms of percentages of total planned subcontracting dollars, for the use of small business concerns; small, disadvantaged business concerns; women-owned small business concerns; historically black colleges and universities (HBCUs) and minority institutions (MIs); and qualified nonprofit agencies for the blind and other severely disabled as subcontractors. The offeror shall include all subcontracts that contribute to contract performance and may include a proportionate share of products and services that are normally allocated as indirect costs.

Percentage Goals:		Corps of Engineers Minimum Subcontracting Goals
Small Business	_____ %	55.0%
Small, Disadvantaged Business	_____ %	8.5%
Women-Owned Small Business	_____ %	3.0%
HBCUs and MIs	_____ %	
Qualified Nonprofit Agencies for the Blind and Other Severely Disabled	_____ %	

2. Statement of: (i) total dollars planned to be subcontracted, (ii) total dollars planned to be subcontracted to small business; (iii) total dollars planned to be subcontracted to small, disadvantaged business; (iv) total dollars planned to be subcontracted to women-owned small business; (v) total dollars planned to be subcontracted to HBCUs and MIs; and (vi) total dollars planned to be subcontracted to qualified nonprofit agencies for the blind and other severely disabled.

Total Cost of Prime Contract:	\$ _____	
Total Dollars to be Subcontracted	\$ _____	_____ % *
To Small Business	\$ _____	_____ % **
To Small, Disadvantaged Business	\$ _____	_____ % **
To Women-Owned Small Business	\$ _____	_____ % **
To HBCUs and MIs	\$ _____	_____ % **
To Qualified Nonprofit Agencies for the Blind and Other Severely Disabled	\$ _____	_____ % **

NOTES: * Calculate percentage of Total Dollars to be Subcontracted to Total Cost of Prime Contract

** Calculate subcontracted dollars to each group to Total Dollars to be Subcontracted, NOT TO Total Cost of Prime Contract.

PLANNED SUBCONTRACTING INCLUDES ALL PLANNED EXPENDITURES. TOTAL ESTIMATED COST TO SUBCONTRACTORS AND GOALS MUST BE ESTABLISHED EVEN IF THE CONTRACT IS OF THE INDEFINITE-DELIVERY TYPE.

SUBCONTRACTS AWARDED TO SMALL, DISADVANTAGED BUSINESSES; WOMEN-OWNED SMALL BUSINESSES; HBCU/MIs; AND QUALIFIED NONPROFIT AGENCIES FOR THE BLIND AND OTHER SEVERELY DISABLED COUNT TOWARD THE OVERALL SMALL BUSINESS GOAL. HBCU/MIs ARE COUNTED AS A SUBSET OF THE SMALL, DISADVANTAGED GOAL. THE CORPS OF ENGINEERS HAS NOT BEEN ASSIGNED A SET GOAL FOR HBCU/MIs OR QUALIFIED NONPROFIT AGENCIES FOR THE BLIND AND OTHER SEVERELY DISABLED.

IN ACCORDANCE WITH DFARS 219.703, QUALIFIED NONPROFIT AGENCIES FOR THE BLIND AND OTHER SEVERELY DISABLED THAT HAVE BEEN APPROVED BY THE COMMITTEE FOR PURCHASE FROM PEOPLE WHO ARE BLIND OR SEVERELY DISABLED UNDER THE JAVITS-WARNER-O'DAY (41 U.S.C. 46-48) ARE ELIGIBLE THROUGH SEPTEMBER 30, 1997, TO PARTICIPATE IN THE PROGRAM.

3. A description of the principal supply and service areas to be subcontracted and an identification of the types planned for subcontracting to (i) small business subcontractors, (ii) small, disadvantaged business subcontractors, (iii) women-owned small business subcontractors, (iv) HBCUs and MIs, (v) qualified nonprofit agencies for the blind and other severely disabled:

4. A statement of the method used in developing the proposed subcontracting goals for small business concerns; small, disadvantaged business concerns; women-owned small business concerns; HBCUs and MIs; and qualified nonprofit agencies for the blind and other severely disabled:

5. Description of the method used to identify potential sources for solicitation purposes to assure small; small, disadvantaged, women-owned small; HBCU and MI; and qualified nonprofit agencies for the blind and other severely disabled participation (e.g., existing company source lists, the Procurement Automated Source System (PASS) of the Small Business Administration, the National Minority Purchasing Council Vendor Information Service, the Research and Information Division of the Minority Business Development Agency in the Department of Commerce, or small; small, disadvantaged, women-owned small, HBCU or MI, or qualified nonprofit agencies for the blind and other severely disabled concerns trade associations):

6. A statement as to whether or not the offeror included indirect costs in establishing the subcontracting goals, and if so, a description of the method used to determine the proportionate share of indirect costs to be incurred with: (i) small business concerns; (ii) small, disadvantaged business concerns; (iii) women-owned small business concerns; (iv) HBCUs and MIs); and (v) qualified nonprofit agencies for the blind and other severely disabled:

7. The name of the individual employed by the offeror who will administer the offeror's subcontracting program and a description of the duties of the individual.

Name: _____

Title and Telephone Number: _____

Address: _____

City, State and Zip Code: _____

Duties (Attachment may be used):

8. Describe the efforts the offeror will make to assure that small business concerns; small, disadvantaged business concerns; women-owned small business concerns; HBCUs and MIs; and qualified nonprofit agencies for the blind and other severely disabled will have an equitable opportunity to compete for subcontractors under this contract:

9. I do herewith assure that this concern will include the clause at FAR 52.219-8 entitled "Utilization of Small, Small Disadvantaged and Women-Owned Small Business Concerns" in all subcontracts which offer further subcontracting opportunities and will require all subcontractors (except small business concerns) who receive subcontracts in excess of \$500,000 (or, in the case of a contract for construction of any public facility, \$1 million) to adopt a plan similar to the plan agreed to by this concern and in consonance with the FAR clause 52.219-9.

10. I also assure that this concern will (i) cooperate in any studies or surveys as may be required, (ii) submit periodic reports in order to allow the Government to determine the extent of compliance by the offeror with the subcontracting plan, and (iii) submit Standard Form (SF) 294, Subcontracting Report for Individual Contracts, and SF 295, Summary Subcontract Report, in accordance with the instructions of the forms, and (iv) ensure that the subcontractors under this contract agree to submit the required SF 294s and 295s. I assure that this concern will submit an SF 295 on Corps of Engineers projects only. The SF 295 shall be completed and distributed in accordance with the Corps of Engineers supplemental instructions. I will not report Corps of Engineers projects through any other agency unless authorized by the Contracting Officer.

11. Provide a recitation of the types of records the offeror will maintain to demonstrate procedures which have been adopted to comply with the requirements and goals set forth in the plan, including the establishment of source lists; and a description of its efforts to locate small business concerns; small, disadvantaged business concerns; women-owned small business concerns; HBCUs and MIs; and qualified nonprofit agencies for the blind and other severely disabled and award subcontracts to them. The records shall include at least the following (on a plant-wide or company-wide basis, unless otherwise indicated):

a. Source lists (e.g., PASS), guides, and other data that identify small business concerns; small, disadvantaged business concerns; women-owned small business concerns; HBCUs and MIs; and qualified nonprofit agencies for the blind and other severely disabled.

b. Organizations contacted in an attempt to locate sources that are small; small disadvantaged; women-owned small business concerns, HBCUs and

MIs; and qualified nonprofit agencies for the blind and other severely disabled.

c. Records on each subcontract solicitation resulting in an award of more than \$100,000, indicating (A) whether small business concerns were solicited and if not, why not, (B) whether small disadvantaged business concerns were solicited and if not, why not, (C) whether women-owned small business concerns were solicited and if not, why not, (D) whether HBCUs and MIs were solicited and if not, why not, (E) whether qualified nonprofit agencies for the blind and other severely disabled were solicited and if not, why not, and (F) if applicable, the reason award was not made to a small business concern.

d. Records of any outreach efforts to contact (A) trade associations, (B) business development organizations, and (C) conferences and trade fairs to locate small; small disadvantaged; women-owned small business sources; HBCUs and MIs; and qualified nonprofit agencies for the blind and other severely disabled.

e. Records of internal guidance and encouragement provided to buyers through (A) workshops, seminars, training, etc., and (B) monitoring performance to evaluate compliance with the programs's requirements.

f. On a contract-by-contract basis, records to support award data submitted by the offeror to the Government, including the name, address, and business size of each subcontractor. Contractors having company or division-wide annual plans need not comply with this requirement.

12. Discuss the extent to which the offeror has historically been successful in complying with the requirements of the clauses at FAR 52.219-8, Utilization of Small, Small Disadvantaged and Women-Owned Small Business Concerns, and 52.219-9, Small, Small Disadvantaged and Women-Owned Small Business Subcontracting Plan, in establishing realistic yet challenging goals and show evidence of ability to achieve the goals. Information addressing past performance on DoD contracts evidencing achievement of established subcontracting goals will be in the form of Standard Forms 294 and 295 (attach these to this plan). Offerors who have had no prior Department of Defense contracts from which to assess past performance will not be penalized. Those who have had prior DoD contracts must provide the SF 294s and 295s on past DoD contracts.

(Signature)

(Title of Corporate Officer)

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SECTION 01130

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SECTION 01130

ENVIRONMENTAL PROTECTION

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

CODE OF FEDERAL REGULATIONS (CFR)

40 CFR 261	Identification and listing of Hazardous Waste
------------	-----------------------------------------------

ENGINEERING MANUALS (EM)

EM 385-1-1	(1996) U.S. Army Corps of Engineers Safety and Health Requirements Manual
------------	---------------------------------------------------------------------------

1.2 DEFINITIONS

Environmental pollution and damage is defined as the presence of chemical, physical, or biological elements or agents that adversely affect human health or welfare; unfavorably alter ecological balances of plant or animal communities; or degrade the environment from an aesthetic, cultural or historic perspective. Environmental protection is the prevention/control of pollution and habitat disruption that may occur during construction. The control of environmental pollution and damage requires consideration of air, water, land, biological and cultural resources; and includes management of visual aesthetics; noise; solid, chemical, gaseous, and liquid waste; radiant energy and radioactive materials; and other pollutants.

1.3 SUBCONTRACTORS:

Compliance with the provisions of this section by subcontractors will be the responsibility of the Contractor.

1.4 ENVIRONMENTAL PROTECTION REQUIREMENTS

The Contractor and subcontractors shall comply with all applicable Federal, State, and local laws and regulations. The Contractor shall provide environmental protective measures and procedures to prevent and control pollution, limit habitat disruption, and correct environmental damage that occurs during construction.

A. Protection of Features

This section supplements the Contract Clauses PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES, AND IMPROVEMENTS; OPERATIONS AND STORAGE AREAS; and CLEANING UP, Section 00700. The Contractor shall prepare a list of features requiring protection under the provisions of the contract clause which are not specially identified on the drawings as environmental features requiring protection. The Contractor shall protect those environmental features, indicated specially on the drawings, in spite of interference which their preservation may cause to the Contractor's work under the contract.

B. Permits

All permits must be obtained from the proper agency and paid for by the Contractor, see Contract Clause, PERMITS AND RESPONSIBILITIES.

C. Environmental Compliance and Monitoring.

All construction activity is subject to Federal Environmental laws including, but not limited to: The National Environmental Policy Act (NEPA); The National Historic Preservation Act (NHPA); Endangered Species Act; Resource Conservation and Recovery Act (RCRA); Comprehensive Environmental Response Liability and Compensation Act (CERCLA); Clean Water Act (CWA); Clean Air Act (CAA); Safe Drinking Water Act (SDWA), and applicable state, regional, and local equivalents. The Contractor is responsible for compliance with these laws.

1.5 ENVIRONMENTAL PROTECTION PLAN

Within 15 calendar days of Notice of Award, the Contractor shall submit an Environmental Protection Plan for review and acceptance by the Contracting Officer. The Government will consider an interim plan for the first 30 days of operations. However, the Contractor shall furnish an acceptable final plan not later than 30 calendar days after receipt of the Notice to Proceed. Acceptance is conditional and is predicated upon satisfactory performance during construction. The Government reserves the right to require the Contractor to make changes in the Environmental Protection Plan or operations if the Contracting Officer determines that environmental protection requirements are not being met. The plan shall detail the actions which the Contractor shall take to comply with all applicable Federal, State, and local laws and regulations concerning environmental protection and pollution control and abatement, as well as the additional specific requirements of this contract. No physical work at the site shall begin prior to acceptance of the Contractor's plan or an interim plan covering the work to be performed. The environmental protection plan shall include, but not be limited to, the following:

A. List of State and Local Laws and Regulations

The Contractor shall provide as part of the Environmental Protection Plan a list of all State and local environmental laws and regulations which apply to the construction operations under the Contract.

B. Spill Control Plan

The Contractor shall include as part of the environmental protection plan, a Spill Control Plan. The plan shall include the procedures, instructions, and reports to be used in the event of an unforeseen spill of a substance regulated by the Emergency Response and Community Right-to-Know Act or regulated under State or local laws or regulations. The Spill Control Plan supplements the requirements of EM 385-1-1. This plan shall include as a minimum:

(1) The name of the individual who will be responsible for implementing and supervising the containment and cleanup.

(2) Training requirements for Contractor's personnel and methods of accomplishing the training.

(3) A list of materials and equipment to be immediately available at the job site, tailored to cleanup work of the potential hazard(s) identified.

(4) The names and locations of suppliers of containment materials and locations of additional fuel oil recovery, cleanup, restoration, and material-placement equipment available in case of an unforeseen spill emergency.

(5) The methods and procedures to be used for expeditious contaminant cleanup.

(6) The name of the individual who will report any spills or hazardous substance releases and who will follow up with complete documentation. This individual shall immediately notify the Contracting Officer in addition to the legally required Federal, State, and local reporting channels (including the National Response Center 1-800-424-8802) if a reportable quantity spill occurs. The plan shall contain a list of the required reporting channels and telephone numbers.

C. Recycling and Waste Minimization Plan

The Contractor shall submit a Recycling and Waste Minimization Plan as a part of the Environmental Protection Plan. The plan shall detail the Contractor's actions to comply with the following recycling and waste minimization requirements:

(1) The Contractor shall participate in State and local government sponsored recycling programs to reduce the volume of solid waste materials at the source.

D. Contaminant Prevention Plan

As a part of the Environmental Protection Plan, the Contractor shall prepare a contaminant prevention statement identifying potentially hazardous substances to be used on the job site and intended actions to prevent accidental or intentional introduction of such materials into the air, water, or ground. The Contractor shall detail provisions to be taken to meet Federal, State, and local laws and regulations regarding the storage and handling of these materials.

E. Environmental Monitoring

The Contractor shall include in the plan the details of environmental monitoring requirements under the laws and regulations and a description of how this monitoring will be accomplished.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 SPECIAL ENVIRONMENTAL PROTECTION REQUIREMENTS

A. Disposal of Solid Wastes

Solid waste is rubbish, debris, waste materials, garbage, and other discarded solid materials (excluding clearing debris and hazardous waste as defined in following paragraphs). Solid waste shall be placed in containers and disposed of daily. All handling and disposal shall be conducted in such a

way as to prevent spillage and contamination. The Contractor shall transport all solid waste off the Government property and dispose in compliance with Federal, State, and local requirements. The Contractor shall comply with site procedures, Federal, State, and local laws and regulations pertaining to the use of the landfill area.

B. Clearing Debris

Clearing debris is trees, tree stumps, tree trimmings, and shrubs, and leaves, vegetative matter, excavated natural materials (e.g., dirt, sand, and rock), and demolition products (e.g., brick, concrete, glass, and metals).

(1) The Contractor shall collect trees, tree stumps, tree trimmings, shrubs, leaves, and other vegetative matter; and shall transport from the project site for proper disposal in compliance with Federal, State, and local requirements. The Contractor shall segregate the matter where appropriate for proper disposal. Untreated and unpainted scrap lumber may be disposed of with this debris where appropriate.

(2) Excavated natural materials shall be transported from the project site for proper disposal in compliance with Federal, State, and local requirements.

(3) Demolition products shall be transported from the project site for proper disposal in compliance with Federal, State, and local requirements.

C. Disposal of Contractor Generated Hazardous Wastes

Hazardous wastes are hazardous substances as defined in 40 CFR 261, or as defined by applicable State and local regulations. Hazardous waste generated by construction activities shall be removed from the work area and be disposed in compliance with Federal, State, and local requirements. The Contractor shall segregate hazardous waste from other materials and wastes, and shall protect it from the weather by placing it in a safe covered location; precautionary measures against accidental spillage such as berming or other appropriate measures shall be taken. Hazardous waste shall be removed from the project site within 60 days. Hazardous waste shall not be dumped onto the ground, into storm sewers or open water courses, or into the sanitary sewer system.

D. Fuels and Lubricants

Fueling and lubrication of equipment and motor vehicles shall be conducted in a manner that affords the maximum protection against spills and evaporation. Lubricants and waste oil to be discarded shall be stored in marked corrosion-resistant containers and recycled or disposed in accordance with Federal, State, and local laws and regulations.

3.2 HISTORICAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES

A. Discovered Historic, Archaeological, and Cultural Resources

If during construction activities, items are observed that may have historic or archaeological value (e.g., Native American human remains or associated objects are discovered), such observations shall be reported immediately to the Contracting Officer so that the appropriate authorities may be notified and a determination made as to their significance and what, if any, special disposition of the finds should be made. The Contractor shall cease all

activities that may result in impact to or the destruction of these resources. The Contractor shall prevent his employees from trespassing on, removing, or otherwise disturbing such resources.

3.3 PROTECTION OF WATER RESOURCES

The Contractor shall keep construction activities under surveillance, management, and control to avoid polluting of surface and ground waters.

3.4 PROTECTION OF AIR RESOURCES

Special management techniques as set out below shall be implemented to control air pollution by the construction activities. These techniques supplement the requirements of Federal, State, and local laws and regulations; and the safety requirements under this Contract. If any of the following techniques conflict with the requirements of Federal, State, or local laws or regulations, or safety requirements under this contract, then those requirements shall be followed in lieu of the following.

A. Particulates

Airborne particulates, including dust particles, from construction activities and processing and preparation of materials shall be controlled at all times, including weekends, holidays, and hours when work is not in progress. The Contractor shall maintain all excavations, stockpiles, haul roads, permanent and temporary access roads, plant sites, disposal sites, borrow areas, and all other work areas free from airborne dust which would cause a hazard or nuisance.

B. Dust Control:

Approved temporary methods of stabilization consisting of sprinkling, chemical treatment, light bituminous treatment or similar methods will be permitted to control dust. Sprinkling, to be approved, must be repeated at such intervals as to keep all parts of the disturbed area at least damp at all times, and the Contractor must have sufficient competent equipment on the job to accomplish this if sprinkling is used. Dust control shall be performed as the work proceeds and whenever a dust nuisance or hazard occurs.

C. Burning Rubbish and Debris:

Open burning of rubbish, debris and other combustibles will not be permitted on the Base.

3.5 INSPECTION

If the Contracting Officer notifies the Contractor in writing of any observed noncompliance with contract requirements or Federal, State, or local laws, regulations, or permits, the Contractor shall inform the Contracting Officer of proposed corrective action and take such action to correct the noncompliance. Such notice, when delivered to the Contractor or his authorized representative at the site of the work, shall be deemed sufficient for the purpose. If the Contractor fails to comply promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action is taken. No time extensions will be granted or costs or damages allowed to the Contractor for any such suspension, unless it was determined that the Contractor was in compliance in accordance with FAR 52.212-12, see Section 00700.

3.6 MAINTENANCE OF POLLUTION CONTROL FACILITIES

The Contractor shall maintain all constructed pollution control facilities and portable pollution control devices for the duration of the Contract or for the length of time construction activities create the particular pollutant.

3.7 TRAINING OF CONTRACTOR PERSONNEL

Contractor personnel shall be trained in environmental protection and pollution control. The Contractor shall conduct environmental protection/pollution control meetings for all Contractor personnel monthly. The training and meeting agenda shall include methods of detecting and avoiding pollution, familiarization with pollution standards, both statutory and contractual, installation and care of facilities (vegetative covers, etc.), and instruments required for monitoring purposes to ensure adequate and continuous environmental protection/pollution control. Anticipated hazardous or toxic chemicals or wastes, and other regulated contaminants, shall also be discussed. Other items to be discussed shall include recognition and protection of archaeologic sites and artifacts.

-- End of Section --

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SECTION 01300

SUBMITTAL PROCEDURES

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SECTION 01300

SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 SUBMITTAL CLASSIFICATION

Submittals are identified with submittal description (SD) numbers and are classified as follows:

1.1.1 Government Approved

Governmental approval is required for extensions of design, critical materials, deviations, equipment whose compatibility with the entire system must be checked, and other items as designated by the Contracting Officer. Within the terms of the Contract Clause entitled "Specifications and Drawings for Construction," they are considered to be "shop drawings."

1.1.2 Information Only

All submittals not requiring Government approval will be for information only. They are not considered to be "shop drawings" within the terms of the Contract Clause referred to above.

1.2 SUBMITTAL REVIEW AND APPROVAL

Before submission, Contractor shall review all submittals prepared by subcontractors, suppliers, and himself, for completeness, accuracy, and compliance with plans and specifications. Contractor shall not use red markings on submittals. Red markings are reserved for use by the Contracting Officer. Approval by Contractor shall be indicated on each drawing by an "Approved" stamp with Contractor's name, signature, and date. The Contractor shall have independent agents not associated with his organization to do the review. The review shall be done by a licensed architect or registered engineers in the appropriate disciplines of architectural, civil, structural, mechanical and electrical, as appropriate. The reviews shall be thorough and complete and authenticated by registered engineer's or architect's stamp. This administration of submittal review must be integrated into the Contractor's Quality Control Plan. The plan must delineate in precise detail how the Contractor intends to satisfy this requirement. This should include names of organizations, qualifications and names of individuals who will be doing the work with their qualifications/resumes. Supplier's or subcontractors certifications are not acceptable as meeting this requirement of independent review. Submittals not conforming to the requirements of this section will be returned to the Contractor for correction and resubmittal.

1.3 GOVERNMENT APPROVED SUBMITTALS

The Contracting Officer's approval of submittals shall not be construed as a complete check, but will indicate only that the general method of construction, materials, detailing and other information are satisfactory. Approval will not relieve the Contractor of the responsibility for any error which may exist, as the Contractor under the CQC requirements of this contract is responsible for dimensions, the design of adequate connections and details, and the satisfactory construction of all work. After submittals have been approved by the Contracting Officer, no resubmittal for the purpose of substituting materials or equipment will be considered unless accompanied by an explanation of why a substitution is necessary.

1.4 DISAPPROVED SUBMITTALS

The Contractor shall make all corrections required by the Contracting Officer and promptly furnish a corrected submittal in the form and number of copies specified for the initial submittal. If the Contractor considers any correction indicated on the submittals to constitute a change to the contract, a notice in accordance with the Contract Clause "Changes" shall be given promptly to the Contracting Officer.

1.5 SUBMITTALS

The Contractor may be required to mail Submittals to multiple locations as directed. The location(s) for Government review of Contractor Submittals will be determined at a meeting between the Contractor and the Administrative Contracting Officer.

1.6 PAYMENT FOR ITEMS FOR WHICH A SUBMITTAL AND APPROVAL IS REQUIRED

In accordance with FAR 52.232-5, "Payments Under Fixed-Price Construction Contracts", the Government shall make progress payments to the Contractor monthly based on estimates of work accomplished which meets the standards of quality established under the contract. On items for which submittals must be approved by the Contracting Officer, payment cannot be made for the item until the Government establishes that the item "meets the standards of quality" required by the contract. The Contractor shall not invoice for, nor shall the Government make payment for any item, for which submittal and approval is required, until the item has been submitted and approved as described herein.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 GENERAL

The Contractor shall make submittals as required by the specifications. The Contracting Officer may request submittals in addition to those specified when deemed necessary to adequately describe the work covered in the respective sections. Units of weights and measures used on all submittals shall be the same as those used in the contract drawings. Each submittal shall be complete and in sufficient detail to allow ready determination of compliance with contract requirements. Prior to submittal, all items shall be checked and approved by the Contractor's Quality Control (CQC) representative and each item shall be stamped, signed, and dated by the CQC representative indicating action taken. Proposed deviations from the contract requirements shall be clearly identified. Submittals shall include items such as: Contractor's, manufacturer's, or fabricator's drawings; descriptive literature including (but not limited to) catalog cuts, diagrams, operating charts or curves; test reports; test cylinders; samples; O&M manuals (including parts list); certifications; warranties; and other such required submittals. Submittals requiring Government approval shall be scheduled and made prior to the acquisition of the material or equipment covered thereby. Samples remaining upon completion of the work shall be picked up and disposed of in accordance with manufacturer's Material Safety Data Sheets (MSDS) and in compliance with existing laws and regulations.

Submittals of all architectural finishes shall all be submitted at the same time so that they may be evaluated as a whole in comparison with the specified coordinated finishes. See Paragraph COLOR BOARDS for additional requirements of submittals.

3.2 SUBMITTAL REGISTER (ENG FORM 4288)

At the end of this section is one set of ENG Form 4288 listing items of equipment and materials for which submittals are required by the specifications; this list may not be all inclusive and additional submittals may be required. Columns "d" through "q" have been completed by the Government; the Contractor shall complete columns "a" through "c" and "s" through "x" and submit two (2) completed forms to the Contracting Officer for approval within fourteen (14) calendar days after Notice to Proceed. The approved submittal register will become the scheduling document and will be used to control submittals throughout the life of the contract. The submittal register and the progress schedules shall be coordinated. The Contractor shall insure that any errors in draft ENG Form 4288 and any omissions are added prior to submission for approval.

3.3 SCHEDULING

Submittals covering component items forming a system or items that are interrelated shall be scheduled to be coordinated and submitted concurrently. Certifications to be submitted with the pertinent drawings shall be so scheduled. Adequate time (a minimum of 14 calendar days exclusive of mailing time) shall be allowed and shown on the register for review and approval. No delay damages or time extensions will be allowed for time lost in late submittals.

3.4 TRANSMITTAL FORM (ENG FORM 4025)

The Contractor shall complete ENG Form 4025, "Transmittal of Shop Drawings, Equipment Data, Material Samples, or Manufacturer's Certificates of Compliance" and forward six (6) copies of same with each set of shop drawings, certificates of compliance, materials, fixtures and equipment lists submitted for approval. Four (4) copies of the ENG Form 4025 shall be submitted for information only data. No translucent or coated reproduced copies will be accepted. Each item submitted shall be listed separately on the ENG Form 4025. For new submittals or resubmittals mark the appropriate box; or resubmittals also insert previous transmittal number. Blank ENG Forms 4025 will be furnished by the Contracting Officer on request. Shop drawings shall be either blue line or black line prints on a white background. Blueprints are not acceptable. Each submittal shall be identified with the Contractor's name, Contract Number, Transmittal Number, and Item Number to correspond with Item Number listed on ENG Form 4288. The following identification shall be marked on submittals as applicable:

- Contract Number
- Project Title and Location
- Subcontractor's Name
- Supplier's Name or Manufacturer's Name
- Specification Section and Paragraph Number
- Contract Drawing File Number

3.5 SUBMITTAL PROCEDURE

Submittals shall be made as follows:

3.5.1 Procedures

Submittals required by the CONTRACT CLAUSES and other non-technical parts of the contract are not included in this section. The Contractor shall submit to the Contracting Officer: six (6) copies for approval, and four (4) copies for information only, of all shop drawings, certificates of compliance, materials, fixtures and equipment lists called for under the various headings of these

specifications. These drawings, certificates and lists shall be complete and detailed and, prior to submission, must be reviewed and certified correct by the Contractor as required by the Quality Control System paragraph of the Construction Quality Control Section. If approved by the Contracting Officer, four (4) sets of all submittals will be retained by the Contracting Officer and two (2) sets will be returned to the Contractor. Submittals for information only usually will not be returned. The Contractor is encouraged to submit paper documents that are printed/copied double-sided on recycled paper that has at least 20% postconsumer material.

3.5.2 Deviations

For submittals which include proposed deviations requested by the Contractor, the column "variation" of ENG Form 4025 shall be checked. The Contractor shall set forth in writing the reason for any deviations and annotate such deviations on the submittal. The Government reserves the right to rescind inadvertent approval of submittals containing unnoted deviations.

3.6 MECHANICAL ROOM LAYOUT DRAWINGS:

The Contractor shall submit a layout drawing, including appropriate elevations and sections as required, for each Mechanical Room showing the room arrangement he proposes for all pieces of equipment and appurtenances thereto (viz., air-conditioning equipment, boilers, compressors, hot water tanks, pumps, electrical control panels, ducts, piping, etc.), that are to be located in the room. The Mechanical Room floor slab will not be placed until the complete Mechanical Room layout drawing has been submitted and approved. No payment will be made to the Contractor for any of the equipment for the room or its installation until these drawings have been approved. Mechanical Room Layout Drawings shall be identified and submitted in the manner specified for "Shop Drawings". Equipment rooms shown on the drawings are of adequate size to accommodate equipment of required capacities, as available from several manufacturers, with sufficient space left for access, servicing, removal, etc. The use of equipment items with dimensions such as to crowd the space will not be permitted.

3.7 SPARE PARTS LIST AND MAINTENANCE OPERATIONS MANUALS:

Within 30 calendar days after approval of shop drawings and equipment lists, the Contractor shall submit, to the Contracting Officer, 3 copies of spare parts lists and operating and maintenance manuals as required under the various headings of these specifications. One reproducible, unfolded copy shall be provided of all operating instructions, control diagrams, etc., that are larger than 8-1/2-inches by 11-inches; this does not apply to standard manufacturer's data.

(A) Spare parts lists shall contain the following listed information:

- (1) Quantity of parts required for 120 days and one year of operation.
- (2) Description of each spare part.
- (3) Drawing number and shop drawing reference.
- (4) Part equipment code number.
- (5) Unit price of each item.
- (6) Total price of all items.

(7) Procurement lead time with particular attention to long lead times.

(8) Name and address of nearest supplier.

(9) Such remarks and data as the manufacturer may consider pertinent.

(10) Complete parts list of all replaceable items.

(B) Operation, Maintenance, and Repair Manuals and Instructions:

(1) The requirements for furnishing operating, maintenance, and repair data/manuals and field instructions under this contract are specified in the Technical Specifications. The Contractor shall submit to the Contracting Officer, not later than 60 calendar days after the Notice to Proceed, an outline showing the proposed submittal date(s) of operation and maintenance manuals to be furnished the Government and the scheduled date(s) of all required field instructions to be provided by Contractor furnished personnel or manufacturer's representatives. All operation and maintenance manuals must be furnished to the Contracting Officer not later than 60 calendar days prior to turnover of the facility to the Government.

(2) Failure on the part of the Contractor to comply with requirements of this clause will result in no further payment until all required O&M data/manuals are submitted and accepted.

(3) All O&M data/manuals submittal data shall be entered in a separate section of the master submittal register.

3.8 COLOR BOARDS:

Five sets of color boards shall be submitted within 90 calendar days after receipt of Notice to Proceed for all projects which involve building construction or building modifications. The board shall include samples of colors and finishes of all interior surfaces such as walls, floors, and ceilings. Material shall be submitted in a standard 8-1/2 inches by 11 inches three-ring binder. Fold-outs may be employed to 25-1/2 inches by 33 inches as long as they refold within the standard binder. Actual material samples shall be displayed showing color, texture, pattern, finish, thickness, etc., for all appearance related items where choice exists. These samples shall be large enough to indicate true patterns. However, care should be taken to present materials in proportion to that which may be installed in a given situation. Samples shall be organized by color schemes with a separate sample for each scheme. The schemes shall be coordinated by room names and numbers shown on the architectural floor plans. Colors shall be labeled with generic color names. Project title and location (Base) shall be placed in the lower right-hand corner of each module. Where special finishes such as architectural concrete, carpet, or prefinished textured metal panels are required, separate samples not less than 8 inches x 10 inches square shall be submitted with the board. If more space is needed, more than one board per set may be submitted. The Contractor shall certify that he has reviewed the color boards in detail and that they are in strict accordance with the contract drawings and specifications except as may be otherwise explicitly stated. Submittal of the color board shall not relieve the Contractor of the responsibility to submit the samples required by the Technical Specifications.

3.9 AS-BUILT DRAWINGS:

(A) General: The Contractor shall send to Contracting Officer one (1) full set of reproducible construction record drawings (30" x 42" cronoflex or 3 mil double matte sheets) and two (2) copies of drawings on 3-1/2" floppy diskettes, in format compatible with AutoCAD, Release 12. The as-built prints shall be a record of the construction as installed and completed by the Contractor. They shall include all the information shown on the contract set of drawings and a record of all deviations, modifications, or changes from those drawings, however minor, which were incorporated in the work, all additional work not appearing on the contract drawings, and all changes which are made after final inspection of the contract work.

In event the Contractor accomplishes additional work which changes the as-built conditions of the facility after submission of the as-built drawings, the Contractor shall furnish revised and/or additional drawings as required to depict as-built conditions. The requirements for these additional drawings will be the same as for the as-built drawings included in the original submission.

(B) Preliminary As-built Prints: The Contractor shall maintain one set of paper prints to show the as-built conditions. These as-built marked prints shall be kept current and available on the jobsite at all times. All changes from the contract plans which are made in the work or additional information which might be uncovered in the course of construction shall be accurately and neatly recorded as they occur by means of details and notes. The as-built marked prints will be jointly inspected for accuracy and completeness by the Contracting Officer's representative and a responsible representative of the construction Contractor prior to submission of each monthly pay estimate. The prints shall show the following information, but not be limited thereto:

(1) The location and description of any utility lines or other installations of any kind or description known to exist within the construction area. The location includes dimensions to permanent features.

(2) The location and dimensions of any changes within the building or structure.

(3) Correct grade or alignment of roads, structures or utilities if any changes were made from contract plans.

(4) Correct elevations if changes were made in site grading.

(5) Changes in details of design or additional information obtained from working drawings specified to be prepared and/or furnished by the Contractor including but not limited to fabrication, erection, installation plans and placing details, pipe sizes, insulation material, dimensions of equipment foundations, etc.

(6) The topography and grades of all drainage installed or affected as a part of the project construction.

(7) All changes or modifications which result from the final inspection.

(8) Options: Where contract drawings or specifications allow options, only the option selected for construction shall be shown on the as-built drawings.

(9) Submittal to Contracting Officer for Review and Approval: Not later than 2 weeks before acceptance of the project by the Government, the Contractor shall deliver to the Contracting Officer one (1) full set of reproducible construction record drawings (30" x 42" cronoflex or 3 mil double

matte sheets) and two (2) copies of drawings on 3-1/2" floppy diskettes, in format compatible with AutoCAD, Release 12, and marked-up specifications complete with amendments, to depict as-built conditions. If upon review, the drawings are found to contain errors and/or omissions, they shall be returned to the Contractor for corrections. The Contractor shall complete the corrections and return the drawings to the Contracting Officer within ten (10) calendar days. If a satisfactory set of as-built drawings are not received within the time limits defined, no further payment will be made to the Contractor until this requirement is satisfied.

3.10 CONTROL OF SUBMITTALS

The Contractor shall carefully control his procurement operations to ensure that each individual submittal is made on or before the Contractor scheduled submittal date shown on the approved "Submittal Register."

3.11 GOVERNMENT APPROVED SUBMITTALS

Upon completion of review of submittals requiring Government approval, the submittals will be identified as having received approval by being so stamped and dated. Four (4) copies of the submittal will be retained by the Contracting Officer and two (2) copies of the submittal will be returned to the Contractor.

3.12 INFORMATION ONLY SUBMITTALS

Normally submittals for information only will not be returned. Approval of the Contracting Officer is not required on information only submittals. The Government reserves the right to require the Contractor to resubmit any item found not to comply with the contract. This does not relieve the Contractor from the obligation to furnish material conforming to the plans and specifications; will not prevent the Contracting Officer from requiring removal and replacement of nonconforming material incorporated in the work; and does not relieve the Contractor of the requirement to furnish samples for testing by the Government laboratory or for check testing by the Government in those instances where the technical specifications so prescribe.

3.13 STAMPS

Stamps used by the Contractor on the submittal data to certify that the submittal meets contract requirements shall be similar to the following:

CONTRACTOR	
(Firm Name)	
_____	Approved
_____	Approved with corrections as noted on submittal data and/or attached sheets(s).
SIGNATURE:	_____
TITLE:	_____
DATE:	_____

-- End of Section --

SUBMITTAL REGISTER <small>(ER 415 1-10)</small>										CONTRACT NO.			
TITLE AND LOCATION						CONTRACTOR				SPECIFICATION SECTION			
Hill AFB, Peacekeeper Storage Facilities										02050			
ACTIVITY	TRANS-MITTAL NO.	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL			CLASSI-FICATION	CONTRACTOR SCHEDULE DATES		CONTRACTOR ACTION		GOVERNMENT ACTION	REMARKS
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TITLE AND LOCATION													CONTRACTOR		SPECIFICATION SECTION											
Hill AFB, Peacekeeper Storage Facilities															03300											
A C T I V I T Y N O	TRANS-MITTAL NO.	I T E M N O	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	CONTRACTOR SCHEDULE DATES										CONTRACTOR ACTION		GOVERNMENT ACTION		REMARKS							
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a.				e.	f.	g.	h.	i.	j.	k.	l.	m.	n.	o.	p.	q.	r.	s.	t.	u.	v.	w.	x.	y.	z.	aa.

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TITLE AND LOCATION						CONTRACTOR				SPECIFICATION SECTION		
Hill AFB, Peacekeeper Storage Facilities										05055		
ACTIVITY	TRANS-MITTAL NO.	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL		CLASSI-FICATION	CONTRACTOR SCHEDULE DATES		CONTRACTOR ACTION		GOVERNMENT ACTION	REMARKS
				INSTRUCTIONS	CERTIFICATIONS		SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	DATE		
a.		i.	e.	f.g.h.i.j.k.l.m.n.o.p.q.r.s.t.u.v.w.x.y.z.	aa.							

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TITLE AND LOCATION													CONTRACTOR		SPECIFICATION SECTION											
Hill AFB, Peacekeeper Storage Facilities															07600											
A C T I V I T Y N O	TRANS-MITTAL NO.	I T E M N O	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	CONTRACTOR SCHEDULE DATES										CONTRACTOR ACTION		GOVERNMENT ACTION		REMARKS							
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a.				e.	f.	g.	h.	i.	j.	k.	l.	m.	n.	o.	p.	q.	r.	s.	t.	u.	v.	w.	x.	y.	z.	aa.

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SECTION 01311

NETWORK ANALYSIS SYSTEM

PART 1 GENERAL

1.1 ER 1-1-11 CONTRACTOR PREPARED NETWORK ANALYSIS SYSTEM (NAS):

(A) The progress chart to be prepared by the Contractor pursuant to the General Clause entitled "SCHEDULE FOR CONSTRUCTION CONTRACTS" shall consist of a network analysis system (NAS) as described below. The scheduling of construction is the responsibility of the Contractor and Contractor management personnel shall actively participate in development of the network logic diagram so that intended sequences and procedures are clearly understood. The Contractor shall provide the NAS in either Arrow Diagram Method (ADM) or Precedence (PDM) format. The network diagram required at the initial schedule submission shall depict the order and interdependence of activities and the method by which the work is to be accomplished. Conditions of submittal are:

(1) The diagram shall show a continuous activity flow from left to right. The activity or event numbers, description, duration, and value shall be shown on the diagram.

(2) Dates shall be shown on the diagram for start of the project, any milestones required by the contract, and contract completion.

(3) The critical path shall be clearly identified.

(4) Submittal, review, procurement, fabrication, delivery, installation, start-up, and testing of special or long lead-time materials and equipment shall be included in the NAS diagram.

(5) Government and other agency activities shall be shown. These include but are not limited to: notice to proceed, approvals, inspections, and utility tie in for phasing requirements.

(B) A preliminary network diagram, defining the Contractor's planned operations for the 90 days shall be provided within 30 calendar days after notice to proceed is acknowledged. The approved preliminary schedule shall be used for payment not to exceed 60 days after notice to proceed.

(C) The initial NAS shall be submitted within 60 calendar days after notice to proceed. It shall provide (1) a reasonable sequence of activities which represent work through the entire project and (2) a reasonable level of activity detail. The schedule interval shall extend from notice to proceed through the contract completion date. Completion of the last activity in the schedule shall be constrained by the contract completion date such that if the projected finish of the last activity falls after the contract completion, then the float calculation shall reflect negative float. Interim milestone dates specified shall be so constrained also. Progress payments will be withheld until the Contractor submits an approvable schedule.

(D) The Contractor shall submit a reproducible and two copies of the network diagram at the initial submittal and three copies of the specified reports at the initial and every monthly update throughout the life of the project. The format of the reports shall contain: Activity Number(s), Activity description, Original Duration, Remaining Duration, Early Start date, Late Start date, Early Finish date, Late Finish date, and Total Float. Precedence schedule reports shall include and display preceding and succeeding activities. Cost and/or Earned Value reports shall contain Estimated Earned

Value, Percent Complete (based on cost), and Earnings to Date. Report formats are as follow:

(1) Logic Report: This report shall list all activities sorted according to activity number. Activities shall be printed in ascending order of activity number. Any standard report which lists all activities including restraints in this manner is acceptable.

(2) Criticality Report: This report shall list all activities sorted in ascending order of total float. Activities which have equal values of total float shall be listed in ascending order of Early Starts.

(3) Cost or Earned Value Report: This report shall compile Contractors total earned value on the project from the notice to proceed until the most recent monthly progress meeting based on agreed progress between the Contractor and the Contracting Officer. Provided that the Contractor has submitted a complete schedule update, this report shall serve as the basis for determining Contractor payment. Activities shall be grouped by bid item and then sorted by activity number(s). This report shall subtotal all activities in a bid item and provide a bid item percent complete and then total all bid items to provide a total project percent complete.

(4) Other sorted reports or curves may be required as project requirements dictate, however, the total number should be limited.

(E) A monthly meeting shall be conducted on site attended by the Contractor's project manager and appropriate Contracting Officer's representatives. During this meeting the Contractor will describe, on an activity by activity basis, all proposed revisions and adjustments to the NAS required to reflect the current status of the project. The Contracting Officer's representative shall approve activity progress, proposed revisions and adjustments, and the use of any optional calculations. The following shall be addressed:

(1) The actual start and actual finish dates for all activities in progress or completed as appropriate.

(2) The estimated remaining duration for each activity in progress. Progress calculations must be based on remaining duration for each activity and be in an approved calculation mode.

(3) The earned value for each activity started but not completed. Payment shall be based on cost of completed activities plus cost to date of in progress activities.

(4) All logic changes pertaining to change orders on which a Notice to Proceed has been issued, Contractor proposed changes in activity sequence or durations, and corrections to schedule logic to avoid out of sequence progress.

(F) Following the monthly progress meeting, a complete update of the NAS based on the approved progress, revisions, and adjustments agreed upon at the meeting shall be computed and submitted not later than 5 working days after the meeting. This update shall be subject to approval of the accurate entry of information agreed upon at the meeting. Actual starts and finishes, remaining duration, or percent complete shall not be automatically updated by default dates contained in many CPM scheduling software systems, except that early start for an activity which could start prior to the update but has no actual start shall default to the data date of the update. Activities which have posted progress without predecessor activities being completed shall be allowed only on a case by case approval of the Contracting Officer's

representative who may require logic changes to correct all such out of sequence progress.

(G) A narrative report shall be provided with each update of the NAS. This report shall include (1) a description of activities and progress along the four most critical paths, (2) a description of current and anticipated problem areas or delaying factors and their impact, and (3) an explanation of the corrective actions taken. Only modifications that have been authorized and approved by the Contracting Officer shall be included in the schedule submission. The narrative report shall specifically reference, on an activity by activity basis, all changes made since the previous period and relate each change to documented, approved schedule changes. This report, along with the progress update above shall provide the basis for the Contractor's progress payment request and the Contractor shall be entitled to progress payments determined from the currently approved NAS update. If the Contractor fails or refuses to furnish the information and NAS data which, in the sole judgement of the Contracting Officer, is necessary for verifying the Contractor's progress, the Contractor shall be deemed not to have provided a progress payment estimate and progress payment will not be made.

(H) The Contractor shall prepare proposed NAS revisions for all contract changes and submit them to the Contracting Officer's representative. These shall include a narrative listing the affected activities, a statement of the expected overall impact of the change proposed, and a sub-network of the affected diagram area. When agreed upon by the Contracting Officer's representative, the change logic and durations shall be utilized in analysis of the overall project and the appropriate impact of the change determined for inclusion of time impact for a modification. When notice to proceed with changes must be issued prior to settlement of price and/or time, the Contractor shall submit the same revisions for concurrence by the Contracting Officer's representative prior to inclusion in the NAS. If the Contractor fails to submit or include such revisions within 30 days of the notice to proceed, the Contracting Officer's representative will furnish to the Contractor suggested logic and/or revised durations to be entered in the NAS until the Contractor submits revisions, and final changes and impact have been negotiated. If the Contractor has any objections to the data furnished by the Contracting Officer, he shall advise the Contracting Officer promptly of his objections and written counterplan, however he will continue to use the revisions by the Contracting Officer until such time as alternate data is approved. If the Contractor fails to submit his alternative plan within 20 days after the date such suggested revisions were furnished by the Contracting Officer, the Contractor will be deemed to have concurred with the Contracting Officer's suggested logic/duration time changes. The changes then will be the basis for equitable adjustment for performance of the work.

(I) In the event the Contractor requests an extension of the contract completion date for any other contractual reason, he shall furnish such justification as the Contracting Officer may deem necessary for a determination of the Contractor's right to an extension of time under the provisions of the contract. In such event the schedule revisions must clearly display that the Contractor has used in full all available float time for the work involved with the request. Actual delays that are found to be caused by the Contractor's own actions or lack of action, and which result in the extension of the projected contract completion date shall not be a cause for extension of the contract completion date. The Contracting Officer may find cause to extend the contract completion date under the contract in the absence of a request by the Contractor when, in the Contracting Officer's judgement, it is equitable.

(J) Float available in the schedule at any time shall not be considered as for exclusive use by either the Contractor or the Government. Extensions of time for performance of work required under Contract Clauses

entitled, "CHANGES", "DIFFERING SITE CONDITIONS", "DEFAULT (FIXED PRICE CONSTRUCTION)", or "SUSPENSION OF WORK" will be granted only to the extent that equitable time adjustments for affected activities exceed the total float along their paths.

(K) To monitor a Contractor's schedule by use of an in-house program, the transfer of data shall be accomplished by requiring a Standard Data Exchange Format. A data disk shall be provided as required by paragraph below, SCHEDULING SYSTEM DATA EXCHANGE FORMAT. The automated scheduling system utilized by the Contractor shall be capable of providing all requirements of this specification. As many data disk(s) as required in the "Standard Data Exchange Format" shall be provided with the Initial Schedule, Monthly Updates, and all NAS revisions or requests for revision. Refer to Paragraph below: SCHEDULING SYSTEM DATA EXCHANGE FORMAT, for a complete description of this format.

1.2 ER 1-1-11 SCHEDULING SYSTEM DATA EXCHANGE FORMAT:

(A) GENERAL

(1) Application of this Provision: The data exchange format provides a platform for exchanging scheduling and planning data between various software systems. This section shall be used in conjunction with paragraph above entitled, "CONTRACTOR PREPARED NETWORK ANALYSIS SYSTEM." The Data Exchange Format shall allow project management systems to share information with other programs. Scheduling information shall be transferred from the Contractor's project management system to the Government as described in this section.

(2) Electronic Data Exchange File Required for All Schedule Submissions:

(a) The Contractor shall provide schedule data in the Data Exchange Format for each Preliminary, Initial, Monthly NAS Updates, and requests for time extensions or change proposals. The Contractor's failure to provide schedule data in the exact format described herein shall result in disapproval of the entire schedule submission.

(b) The entire set of schedule data shall be transferred at every exchange of scheduling data. Thus, for updates to existing projects, the data exchange file shall contain all activities that have not started or are already complete as well as those activities in progress.

(3) Data Transfer Responsibility: The Contractor shall be responsible for Electronic Data Exchange File data that may have been lost or destroyed during transit between the Contractor and the Contracting Officer. If Electronic Data Exchange File data is damaged during transit, then the Contractor shall provide the Contracting Officer with a new Electronic Data Exchange File within two (2) working days of notification by the Contracting Officer.

(4) Data Consistency Responsibility: The Contractor shall be responsible for the consistency between the Electronic Data Exchange File and printed reports which accompany schedule submissions. If Electronic Data Exchange File data for a schedule submission differs, in any way, from the printed schedule reports or standard activity coding, then the Contracting Officer shall disapprove the entire schedule submission. The Contractor shall provide the Contracting Officer with a completely revised, and consistent, schedule submission within 24 hours of notification of inconsistency by the Contracting Officer.

(5) Creating the Electronic Data Exchange File: This equipment shall be Year 2000 compliant and shall be able to accurately process date/time data (including, but not limited to, calculating, comparing, and sequencing) from, into, and between the twentieth and twenty-first centuries, including leap year calculations, when used in accordance with the product documentation provided by the Contractor, provided that all products (e.g. hardware, software, firmware) used in combination with other information technology shall accurately process date/time data if the other information technology properly exchanges date/time data with it. The Contractor shall have the option of creating the electronic data exchange file by one of the three following methods:

(a) Commercially Available Software: The Contractor shall be required to secure software that meets this requirement. Many commercially available scheduling systems support the standard data exchange format.

(b) Interface Program: Under this option the Contractor shall produce his own data translation software. This software shall take the information provided by the Contractor's scheduling system and reformat the data into the Data Exchange Format.

(c) Manual Methods: Under this option the Contractor shall manually reformat his scheduling system report files or create all necessary data by manually entering all data into the Data Exchange Format.

(B) GENERAL DATA EXCHANGE FILE REQUIREMENTS:

(1) File Transfer Medium: All required data shall be submitted on 5-1/4" diskette(s), formatted to hold 360 KB of data, under the MS-DOS version 2.0 (or higher) operating system. Higher data densities and other operating systems may be approved by the Contracting Officer if compatible with the Government's computing capability.

(2) File Type and Format: The data file shall consist of a 132 character, fixed format, "ASCII" file. Text shall be left-justified and numbers shall be right-justified in each field. Data records must conform, exactly, to the sequence, column position, maximum length, mandatory values, and field definitions described below to comply with this standard data exchange format. Unless specifically stated, all numbers shall be whole numbers. All data columns shall be separated by a single blank column.

(3) Electronic Data Exchange File Name: The Contractor shall insure that each file has a name related to either the schedule data date, project name, or contract number. No two Electronic Data Exchange Files shall have the same name through the life of this contract. The Contractor shall submit his file naming convention to the Contracting Officer for approval. In the event that the Contractor's naming convention is disapproved, the Contracting Officer shall direct the Contractor to provide files under a unique file naming convention.

(4) Disc Label: The Contractor shall affix a permanent exterior label to each diskette submitted. The label shall contain the type of schedule (Preliminary, Initial, Update, or Change), full project number, project name, project location, data date, name and telephone number of the Contractor's scheduler, and the MS-DOS version used to format the diskette.

(5) Standard Activity Coding Dictionary: The Contractor shall submit, with the initial schedule submission, a consistent coding scheme that shall be used throughout the project for the Activity Codes shown in Paragraph 12.e of this section. The coding scheme submitted shall demonstrate that each code shall only represent one type of information through the duration of the

contract. Incomplete coding of activities or an incomplete coding scheme shall be sufficient for disapproval of the schedule.

(C) DATA FORMAT

(1) Data Exchange File Format Organization: The Data Exchange File Format shall consist of the following records provided in the exact sequence shown below:

<u>Paragraph Reference</u>	<u>Record Description</u>	<u>Remarks</u>
(2)(a)	Volume Record	First Record on Every Data Disk
(2)(b)	Project ID Record	Second Record
(2)(c)	Calendar Record(s)	Minimum of One Record Required
(2)(d)	Holiday Record(s)	Optional Record
(2)(e)	Activity Record(s)	Mandatory Record
(2)(f)	Precedence Records	Mandatory for Precedence Method
(2)(g)	Unit Cost Record(s)	Optional for Unit Cost Projections
(2)(h)	Progress Record(s)	Mandatory for Updates
(2)(I)	File End Record	Last Record of Data File

(2) Record Descriptions:

(a) Volume Record: The Volume Record shall be used to control the transfer of data that may not fit on a single disk. The first record in every disk used to store the data exchange file shall contain the Volume Record. The Volume Record shall sequentially identify the number of the data transfer disk(s). The Volume Record shall have the following format:

<u>Description</u>	<u>Column Position</u>	<u>Max. Len.</u>	<u>Reqd. Value</u>	<u>Type</u>	<u>Just.</u>
RECORD IDENTIFIER	1- 4	4	VOLM	Fixed	
DISK NUMBER	6- 7	2		Number	Right

1. The RECORD IDENTIFIER is the first four characters of this record. The required value for this field shall be "VOLM".

2. The DISK NUMBER field shall identify the number of the data disk used to store the data exchange information. If all data may be contained on a single disk, this field shall contain the value of "1". If more disks are required, then the second disk shall contain the value "2", the third disk shall be designated with a "3", and so on. Identification of the last data Identification of the last data disk is accomplished in the PROJECT END RECORD (see paragraph 17.1).

(b) Project ID Record: The Project ID Record is the second record of the file and shall contain project information in the following format:

<u>Description</u>	<u>Column Position</u>	<u>Max. Len.</u>	<u>Reqd. Value</u>	<u>Type</u>	<u>Just.</u>
RECORD IDENTIFIER	1- 4	4	PROJ.	Fixed	
DATA DATE	6- 12	7	-	ddmmmyy	See (2)
PROJECT IDENTIFIER	14- 17	4	-	Alpha.	Left
PROJECT NAME	19- 66	48	-	Alpha.	Left
CONTRACTOR NAME	68- 103	36	-	Alpha.	Left
ARROW OR PRECEDENCE	105	1	A,P	Fixed	
CONTRACT NUMBER	107-112	6	-	Alpha.	Left

PROJECT START	114-120	7	-	ddmmyy	Filled
PROJECT END	122-128	7	-	ddmmyy	Filled

1 The RECORD IDENTIFIER is the first four characters of this record. The required value for this field shall be "PROJ". This record shall contain the general project information and indicates which scheduling method shall be used.

2 The DATA DATE is the date of the schedule calculation. The abbreviation "ddmmyy" refers to a date format that shall translate a date into two numbers for the day, three letters for the month, and two numbers for the year. For example, March 1, 1999 shall be translated into 01Mar99. This same convention for date formats shall be used throughout the entire data format. To insure that dates are translated consistently, the following abbreviations shall be used for the three character month code:

<u>Abbreviation</u>	<u>Month</u>
JAN	January
FEB	February
MAR	March
APR	April
MAY	May
JUN	June
JUL	July
AUG	August
SEP	September
OCT	October
NOV	November
DEC	December

3 The PROJECT IDENTIFIER is a maximum of four character abbreviation for the schedule. These four characters shall be used to uniquely identify the project and specific update as agreed upon by the Contractor and Contracting Officer. When utilizing scheduling software these four characters shall be used to select the project. Software manufacturers' shall verify that data importing programs do not automatically overwrite other schedules with the same PROJECT IDENTIFIER.

4 The PROJECT NAME field shall contain the name and location of the project edited to fit the space provided. The data appearing here shall appear on scheduling software reports. The abbreviation "Alpha", used throughout paragraph six, RECORD DESCRIPTIONS, refers to an "Alphanumeric" field value.

5 The CONTRACTOR NAME field shall contain the Construction Contractor's name edited to fit the space provided.

6 The ARROW OR PRECEDENCE field shall indicate which method shall be used for calculation of the schedule. The value "A" shall signify the Arrow Diagramming Technique. The value "P" shall signify the Precedence Diagramming Technique. The ACTIVITY IDENTIFICATION field of the Activity Record shall be interpreted differently depending on the value of this field (see paragraph 12.e.2). The Precedence Record shall be required if the value of this field is "P" (see paragraph 12.f).

7 The CONTRACT NUMBER field shall directly identify the contract for the project. For example, a complete government construction contract number, "DACA05-89-C-0001", shall be entered into this field as "890001".

8 The PROJECT START shall contain the date that the project will start or has started. On government construction projects, this date is the date that the construction Contractor acknowledges the Notice to Proceed.

9 The PROJECT END shall contain the data that the contract must complete on or prior to. On government construction projects, this date is the PROJECT START plus the contract period, typically expressed in a specific number of calendar days.

(c) Calendar Record: The Calendar Record(s) shall follow the Project Identifier Record in every data file. A minimum of one Calendar Record shall be required for all data exchange activity files. The format for the Calendar Record shall be as follows:

<u>Description</u>	<u>Column Position</u>	<u>Max. Len.</u>	<u>Reqd. Value</u>	<u>Type</u>	<u>Just.</u>
RECORD IDENTIFIER	1- 4	4	CLDR	Fixed	
CALENDAR CODE	6- 6	1	-	Alpha.	Filled
WORKDAYS	8- 14	7	SMTWTFS	See (3)	
CALENDAR DESCRIPTION	16- 45	30	-	Alpha.	Left

1 The RECORD IDENTIFIER shall always begin with "CLDR" to identify it as a Calendar Record. Each Calendar Record used shall have this identification in the first four columns.

2 The CALENDAR CODE shall be used in the activity records to signify that this calendar is associated with the activity.

3 The WORKDAYS field shall contain the work-week pattern selected with "Y", for Yes, and "N", for No. The first character shall be Sunday and the last character shall be Saturday. An example of a typical five (5) day work-week would be NYYYYYN. A seven (7) day work-week would be YYYYYYY.

4 The CALENDAR DESCRIPTION shall be used to briefly explain the calendar used.

(d) Holiday Record:

Optional Holiday Record(s) shall follow the Calendar Record(s). The Holiday Record shall be used to designate specific non-work days for a specific Calendar. More than one Holiday Record may be used for a particular calendar. If used, the following format shall be followed:

<u>Description</u>	<u>Column Position</u>	<u>Max. Len.</u>	<u>Reqd. Value</u>	<u>Type</u>	<u>Just.</u>
RECORD IDENTIFIER	1- 4	4	HOLI.	Fixed	
CALENDAR CODE	6- 6	1	-	Alpha.	Filled
HOLIDAY DATE	8- 14	7	-	ddmmyy	Filled
HOLIDAY DATE	16- 22	7	-	ddmmyy	Filled
HOLIDAY DATE	24- 30	7	-	ddmmyy	Filled
HOLIDAY DATE	32- 38	7	-	ddmmyy	Filled
HOLIDAY DATE	40- 46	7	-	ddmmyy	Filled
HOLIDAY DATE	48- 54	7	-	ddmmyy	Filled
HOLIDAY DATE	56- 62	7	-	ddmmyy	Filled
HOLIDAY DATE	64- 70	7	-	ddmmyy	Filled
HOLIDAY DATE	72- 78	7	-	ddmmyy	Filled
HOLIDAY DATE	80- 86	7	-	ddmmyy	Filled
HOLIDAY DATE	88- 94	7	-	ddmmyy	Filled
HOLIDAY DATE	96- 112	7	-	ddmmyy	Filled
HOLIDAY DATE	114-120	7	-	ddmmyy	Filled
HOLIDAY DATE	122-128	7	-	ddmmyy	Filled

1 The RECORD IDENTIFIER shall always begin with "HOLI" and shall signify an Optional Holiday Calendar is to be used.

2 The CALENDAR CODE indicates which work-week calendar the holidays shall be applied to. More than one HOLI record may be used for a given CALENDAR CODE.

3 The HOLIDAY DATE is to be used for each date to be designated as a non-work day.

(e) Activity Records: Activity Records shall follow any Holiday Record(s). If there are no Holiday Record(s), then the Activity Records shall follow the Calendar Record(s). There shall be one Activity Record for every activity in the network. Each activity shall have one record in the following format:

<u>Description</u>	<u>Column Position</u>	<u>Max. Len.</u>	<u>Reqd. Value</u>	<u>Type</u>	<u>Just.</u>
RECORD IDENTIFIER	1- 4	4	ACTV	Fixed	
ACTIVITY IDENTIFICATION	6- 15	10	-	See (2)	
ACTIVITY DESCRIPTION	17- 46	30	-	Alpha.	Left
ACTIVITY DURATION	48- 50	3	-	Integer	Right
ACTIVITY COST	52- 60	9	-	Integer	Right
CONSTRAINT DATE	62- 68	7	-	ddmmyy	Filled
CONSTRAINT TYPE	70- 71	2	-	See (7)	
CALENDAR CODE	73- 73	1	-	Alpha.	Filled
HAMMOCK CODE	75- 75	1	Y,blank	Fixed	
WORKERS PER DAY	77- 79	3	-	Integer	Right
RESPONSIBILITY CODE	81- 84	4	-	Alpha.	Left
WORK AREA CODE	86- 89	4	-	Alpha.	Left
MOD OR CLAIM NUMBER	91- 94	4	-	Alpha.	Left
BID ITEM	96- 99	4	-	Alpha.	Left
UCI CODE	101-105	5	-	See (15)	
USER DEFINED 1	107-110	4	-	See (16)	
USER DEFINED 2	112-115	4	-	See (16)	
USER DEFINED 3	117-120	4	-	See (16)	
USER DEFINED 4	122-125	4	-	See (16)	
USER DEFINED 5	127-130	4	-	See (16)	

1 The RECORD IDENTIFIER for each activity description record must begin with the four character "ACTV" code. This field shall be used for both the Arrow Diagram Method (ADM) and Precedence Diagram Method (PDM) (See paragraph 12.b.6).

2 The ACTIVITY IDENTIFICATION consists of coding that differs, depending on whether the ADM or PDM method was selected in the Project Record (see paragraph 6.b.6). If the ADM method was selected, then the field shall be interpreted as two right-justified fields of five (5) integers each. If the PDM method was selected, the field shall be interpreted as one (1) right-justified field of ten (10) integers each. The maximum activity number allowed under this arrangement is 99999 for ADM and 9999999999 for the PDM method.

3 The ACTIVITY DESCRIPTION shall be a maximum of 30 characters. Descriptions must be limited to the space provided.

4 The ACTIVITY DURATION contains the estimated duration for the activity on the schedule. The duration shall be based upon the work-week designated by the activity's related calendar (referenced in 12.e.8).

5 The ACTIVITY COST contains the estimated earned value of the work to be accomplished in the activity.

6 The CONSTRAINT DATE field shall be used to identify a date that the scheduling system may use to modify float calculations. If there is a date in this field, then there must be a valid entry in the CONSTRAINT TYPE field. The CONSTRAINT DATE shall be the same as, or later than, the PROJECT START DATE. The CONSTRAINT DATE shall be the same as, or earlier than, the PROJECT END DATE.

7 The CONSTRAINT TYPE field shall be used to identify the way that the scheduling system shall use the CONSTRAINT DATE to modify schedule float calculations. If there is a value in this field, then there must be a valid entry in the CONSTRAINT DATE field. Below are the minimum list of entries for the CONSTRAINT TYPE. Other types may be available from specific software manufacturers.

<u>Code</u>	<u>Definition</u>
ES	The CONSTRAINT DATE shall replace an activity's early start date, if the early start date is prior to the CONSTRAINT DATE.
IF	The CONSTRAINT DATE shall replace an activity's late finish date, if the late finish date is after the CONSTRAINT DATE.

8 The CALENDAR CODE, as previously explained, relates this activity to an appropriate work-week calendar. The ACTIVITY DURATION must be based on the valid work-week referenced by this CALENDAR CODE field (See paragraph 12.e.4).

9 The HAMMOCK CODE indicates that a particular activity does not have its own independent duration, but takes its start dates from the start date of the preceding activity (or mode) and takes its finish dates from the finish dates of its succeeding activity (or mode). If the value of the HAMMOCK ACTIVITY field is "Y", then the activity is a HAMMOCK ACTIVITY.

10 The WORKERS PER DAY is an optional field that shall be specified at the discretion of the Field Operating Agency (FOA). This field shall contain the average number of workers expected to work on the activity each day the activity is in progress. The total duration times the average number of workers per day shall equal the Contractor's estimate of the total man days of work required to perform the activity.

11 The RESPONSIBILITY CODE shall identify the Subcontractor or major trade involved with completing the work for the activity.

12 The WORK AREA CODE shall identify the location of the activity within the project.

13 The MOD OR CLAIM NUMBER code is an optional field that shall be specified at the discretion of the Field Operating Agency (FOA). This code shall uniquely identify activities that are changed on a construction contract modification, or activities that justify any claimed time extensions.

14 The BID ITEM field is an optional field that shall be specified at the discretion of the Field Operating Agency (FOA). This field shall designate the bid item number associated with the activity.

15 The CONSTRUCTION SPECIFICATION INSTITUTE MASTERFORMAT CSI CODE is an optional field that shall be specified at the discretion of the Field Operating Agency (FOA). The CSI CODE shall contain the value of code corresponding to the work to be accomplished in this activity.

16 USER DEFINED fields are optional and not required to meet the data exchange standard. They are provided to allow for a fixed expansion of capabilities for individual very large projects that may require additional fields.

(f) Precedence Record: The Precedence Record(s) shall follow the Activity Records if a Precedence Type Schedule (PDM) is identified in the ARROW OR PRECEDENCE field of the Project Record (see paragraph 12.b.6). The Precedence Record has the following format:

<u>Description</u>	<u>Column Position</u>	<u>Max. Len.</u>	<u>Reqd. Value</u>	<u>Type</u>	<u>Just.</u>
RECORD IDENTIFIER	1- 4	4	PRED	Fixed	
ACTIVITY IDENTIFICATION	6- 15	10	-	Integer	See (2)
PRECEDING ACTIVITY	17- 26	10	-	Integer	
PREDECESSOR TYPE	28- 29	2	-	See (4)	
LAG DURATION	31- 34	4	-	Integer	Right

1 The RECORD IDENTIFIER shall begin with the four character "PRED" in the first four columns of the record.

2 The ACTIVITY IDENTIFICATION identifies the activity whose predecessor shall be specified in this record. Refer to the Activity Record for further explanation on this field (see paragraph 12.e.2).

3 The PREDECESSOR ACTIVITY number is the number of an activity that proceeds the activity noted in the ACTIVITY IDENTIFICATION field.

4 The PREDECESSOR TYPE field indicates the type of relationship that exists between the chosen pair of activities. The PREDECESSOR TYPE field must, as a minimum, contain one of the codes listed below. Other types of activity relations may be supported from specific software vendors.

<u>Code</u>	<u>Definition</u>
-------------	-------------------

SS Start-to-Start relationship
FF Finish-to-Finish relationship
FS Finish-to-Start relationship

5 The LAG DURATION field contains the number of days delay between the preceding and current activity.

(g) Unit Cost Record: The Unit Cost Record shall follow all Precedence Records. If the schedule utilizes the ARROW DIAGRAM METHOD, then the Unit Cost Record shall follow any Activity Records. The fields for this record shall take the following format:

<u>Description</u>	<u>Column Position</u>	<u>Max. Len.</u>	<u>Reqd. Value</u>	<u>Type</u>	<u>Just.</u>
RECORD IDENTIFIER	1- 4	4	UNIT	Fixed	
ACTIVITY IDENTIFICATION	6- 15	10	-	Integer	See
(2) TOTAL QTY	17- 27	11	-	Floating	Pt.
COST PER UNIT	29- 39	11	-	Floating	Pt.
QTY TO DATE	41- 51	11	-	Floating	Pt.
UNIT OF MEASURE	53- 55	3	-	Alpha.	

1 The RECORD IDENTIFIER shall be identified with the four character "UNIT" placed in the first four columns of the record.

2 The ACTIVITY IDENTIFICATION for each activity shall match the format described in the activity record (see paragraph 12.e.2).

3 The TOTAL QTY is the total amount of this type of material to be used in this activity. This number consists of eight digits, one decimal point, and two more digits. An example of a number in this format is "11111111.11". If the decimal places are not needed, this field shall still contain a ".00" in columns 25, 26, and 27.

4 The COST PER UNIT is the cost, in dollars and cents, for each unit to be used in this activity. This number consists of eight digits, one decimal point, and two more digits. An example of a number in this format is "11111111.11". If the decimal places are not needed, this field shall still contain a ".00" in columns 37, 38, and 39.

5 The QTY TO DATE is the quantity of material installed in this activity up to the data date. This number consists of eight digits, one decimal point, and two more digits. If the decimal places are not needed, this field shall still contain a ".00" in columns 49, 50, and 51.

6 The UNIT OF MEASURE is an abbreviation that may be used to describe the units being measured for this activity.

(h) Progress Record: Progress Record(s) shall follow all Unit Cost Record(s). If there are no Unit Cost Record(s), then the Progress Record(s) shall follow all Precedence Records. If the schedule utilizes the Arrow Diagram Method, then the Progress Record shall follow any Activity Records. One Record shall exist for each activity in-progress or completed. The fields for this Record shall take the following format:

<u>Description</u>	<u>Column Position</u>	<u>Max. Len.</u>	<u>Reqd. Value</u>	<u>Type</u>	<u>Just.</u>
RECORD IDENTIFIER	1- 4	4	PROG	Fixed	
ACTIVITY IDENTIFICATION	6- 15	10	-	Integer	See (2)
ACTUAL START DATE	17- 23	7	-	ddmmyy	Full
ACTUAL FINISH DATE	25- 31	7	-	ddmmyy	Full
REMAINING DURATION	33- 35	3	-	Integer	Right
COST TO DATE	37- 45	9	-	Integer	Right

1 The RECORD IDENTIFIER shall begin with the four character "PROG" in the first four columns of the record.

2 The ACTIVITY IDENTIFICATION for each activity for which progress has been posted, shall match the format described in the Activity Record (see paragraph 12.e.2).

3 An ACTUAL START DATE is required for all in-progress activities. The ACTUAL START DATE shall be the same as, or later than, the PROJECT START date contained in the Project Record (see paragraph 12.b.8). The ACTUAL START DATE shall also be the same as, or prior to, the DATA DATE contained in the Project Record (see Paragraph 12.b.2).

4 An ACTUAL FINISH DATE is required for all completed activities. If the REMAINING DURATION of an activity is zero, then there must be an ACTUAL FINISH DATE. The ACTUAL FINISH DATE must be the same as, or later than the PROJECT START date contained in the Project Record (see paragraph 12.b.8). The ACTUAL FINISH DATE must also be the same as, or prior to the DATA DATE contained in the Project Record (see paragraph 12.b.2).

5 A REMAINING DURATION is required for all in-progress activities. Activities completed, based on time, shall have a zero (0) REMAINING DURATION.

6 Cost progress is contained in the field COST TO DATE. If there is an ACTUAL START DATE, then there must also be some value for COST TO DATE. The COST TO DATE is not tied to REMAINING DURATION. For example, if the REMAINING DURATION is "0", the COST TO DATE may only be 95% of the ACTIVITY COST. This difference may be used to reflect 5% retainage for punch list items.

(i) File End Record:

1 The File End Record shall be used to identify that the data file is completed. This record shall be the last record of the entire data file. The File End Record shall have the following format:

<u>Description</u>	<u>Column Position</u>	<u>Max. Len.</u>	<u>Reqd. Value</u>	<u>Type</u>	<u>Just.</u>
RECORD IDENTIFIER	1- 3	3	END	Fixed	

2 The RECORD IDENTIFIER for the File End Record shall be "END". No data contained in the data exchange file that occurs after this record is found shall be used.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

-- End of Section --

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SECTION 01415

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SECTION 01415

METRIC MEASUREMENTS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM E 380	(1993) Practice for Use of the International System of Units (SI)
ASTM E 621	(1994) Practice for Use of Metric (SI) Units in Building Design and Construction

1.2 GENERAL

This project includes metric units of measurements. The metric units used are the International System of Units (SI) developed and maintained by the General Conference on Weights and Measures (CGPM); the name International System of Units and the international abbreviation SI were adopted by the 11th CGPM in 1960. A number of circumstances require that both metric SI units and English inch-pound (I-P) units be included in a section of the specifications. When both metric and I-P measurements are included, the section may contain measurements for products that are manufactured to I-P dimensions and then expressed in mathematically converted metric value (soft metric) or, it may contain measurements for products that are manufactured to an industry recognized rounded metric (hard metric) dimensions but are allowed to be substituted by I-P products to comply with the law. Dual measurements are also included to indicate industry and/or Government standards, test values or other controlling factors, such as the code requirements where I-P values are needed for clarity or to trace back to the referenced standards, test values or codes.

1.3 USE OF MEASUREMENTS

Measurements shall be either in SI or I-P units as indicated, except for soft metric measurements or as otherwise authorized. The Contractor shall be responsible for all associated labor and materials when authorized to substitute one system of units for another and for the final assembly and performance of the specified work and/or products.

1.3.1 Hard Metric

A hard metric measurement is indicated by an SI value with no expressed correlation to an I-P value, i.e., where an SI value is not an exact mathematical conversion of an I-P value, such as the use of 100 mm in lieu of 4 inches. Hard metric measurements are often used for field data such as distance from one point to another or distance above the floor. Products are considered to be hard metric when they are manufactured to metric dimensions or have an industry recognized metric designation.

1.3.2 Soft Metric

a. A soft metric measurement is indicated by an SI value which is a mathematical conversion of the I-P value shown in parentheses (e.g. 38.1 mm (1-1/2 inches)). Soft metric measurements are used for measurements pertaining to products, test values, and other situations where the I-P units are the standard for manufacture, verification, or other controlling factor. The I-P value shall govern while the metric measurement is provided for information.

b. A soft metric measurement is also indicated for products that are manufactured in industry designated metric dimensions but are required by law to allow substitute I-P products. These measurements are indicated by a manufacturing hard metric product dimension followed by the substitute I-P equivalent value in parentheses (e.g., 190 x 190 x 390 mm (7-5/8 x 7-5/8 x 15-5/8 inches)).

1.3.3 Neutral

A neutral measurement is indicated by an identifier which has no expressed relation to either an SI or an I-P value (e.g., American Wire Gage (AWG) which indicates thickness but in itself is neither SI nor I-P).

1.4 COORDINATION

Discrepancies, such as mismatches or product unavailability, arising from use of both metric and non-metric measurements and discrepancies between the measurements in the specifications and the measurements in the drawings shall be brought to the attention of the Contracting Officer for resolution.

1.5 RELATIONSHIP TO SUBMITTALS

Submittals for Government approval or for information only shall cover the SI or I-P products actually being furnished for the project. The Contractor shall submit the required drawings and calculations in the same units used in the contract documents describing the product or requirement unless otherwise instructed or approved. The Contractor shall use ASTM E 380 and ASTM E 621 as the basis for establishing metric measurements required to be used in submittals.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

-- End of Section --

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SECTION 01440

CONTRACTOR QUALITY CONTROL

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SECTION 01440

CONTRACTOR QUALITY CONTROL

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 3740	(1994a) Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
ASTM E 329	(1993b) Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction

SACRAMENTO DISTRICT CONSTRUCTION CONTROL MANUAL

Latest edition published by the U.S. Army Engineer District-Sacramento, Sacramento, California. Copies of this publication are available upon request from the Sacramento District Office during the bidding period. In addition, two copies of the Manual and an initial supply of test forms will be furnished to the successful bidder upon award of this contract. This Manual specifies the minimum number of tests to be made and includes forms which shall be used to report data.

SPK FORM 437 - MATERIALS TEST SUMMARY

Published by U.S. Army Engineer District - Sacramento, Sacramento, California. One set of this form (6 pages), is included in the bid package issued by the Sacramento District Office. This form will be used to summarize the minimum number of materials testing to be made during construction. The successful bidder shall submit three copies of the form to the Contracting Officer's Representative during the preconstruction meeting. To complete the form, the use of the Construction Control Manual is mandatory.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 GENERAL

The Contractor is responsible for quality control and shall establish and maintain an effective quality control system in compliance with the Contract Clause entitled "Inspection of Construction." The quality control system shall consist of plans, procedures, and organization necessary to produce an end product which complies with the contract requirements. The system shall cover all construction operations, both onsite and offsite, and shall be keyed to the proposed construction sequence. The project superintendent will be held responsible for the quality of work on the job and is subject to removal by the Contracting Officer for non-compliance with quality requirements specified in the contract. The project superintendent in this context shall mean the individual with the responsibility for the overall management of the project including quality and production.

3.2 QUALITY CONTROL PLAN

3.2.1 General

The Contractor shall furnish for review by the Government, not later than 15 days after receipt of notice to proceed, the Contractor Quality Control (CQC) Plan proposed to implement the requirements of Section 00800, Paragraph, "Inspection of Construction." The plan shall identify personnel, procedures, control, instructions, test, records, and forms to be used. Construction will be permitted to begin only after acceptance of the CQC Plan unless specific written authority is granted by the Contracting Officer. Work outside of the features of work included in an accepted plan will not be permitted to begin until acceptance of a CQC Plan or an interim plan containing the additional features of work to be started.

3.2.2 Content of the CQC Plan

The CQC Plan shall include, as a minimum, the following to cover all construction operations, both onsite and offsite, including work by subcontractors, fabricators, suppliers, and purchasing agents:

a. A description of the quality control organization, including a chart showing lines of authority and acknowledgment that the CQC staff shall implement the three phase control system for all aspects of the work specified. The staff shall include a CQC System Manager who shall report to the project superintendent.

b. The name, qualifications (in resume format), duties, responsibilities, and authorities of each person assigned a CQC function.

c. A copy of the letter to the CQC System Manager signed by an authorized official of the firm which describes the responsibilities and delegates sufficient authorities to adequately perform the functions of the CQC System Manager, including authority to stop work which is not in compliance with the contract. The CQC System Manager shall issue letters of direction to all other various quality control representatives outlining duties, authorities, and responsibilities. Copies of these letters will also be furnished to the Government.

d. Procedures for scheduling, reviewing, certifying, and managing submittals, including those of subcontractors, offsite fabricators, suppliers, and purchasing agents. These procedures shall be in accordance with Section 01300 SUBMITTAL PROCEDURES.

e. Control, verification, and acceptance testing procedures for each specific test to include the test name, specification paragraph requiring test, feature of work to be tested, test frequency, and person responsible for each test. (Laboratory facilities will be approved by the Contracting Officer.)

f. Procedures for tracking preparatory, initial, and follow-up control phases and control, verification, and acceptance tests including documentation.

g. Procedures for tracking construction deficiencies from identification through acceptable corrective action. These procedures will establish verification that identified deficiencies have been corrected.

h. Reporting procedures, including proposed reporting formats.

i. A list of the definable features of work. A definable feature of work is a task which is separate and distinct from other tasks and has separate control requirements. It could be identified by different trades or

disciplines, or it could be work by the same trade in a different environment. Although each section of the specifications may generally be considered as a definable feature of work, there are frequently more than one definable feature under a particular section. This list will be agreed upon during the coordination meeting.

3.2.3 Acceptance of Plan

Acceptance of the Contractor's plan is required prior to the start of construction. Acceptance is conditional and will be predicated on satisfactory performance during the construction. The Government reserves the right to require the Contractor to make changes in his CQC Plan and operations including removal of personnel, as necessary, to obtain the quality specified.

3.2.4 Notification of Changes

After acceptance of the CQC Plan, the Contractor shall notify the Contracting Officer in writing of any proposed change. Proposed changes are subject to acceptance by the Contracting Officer.

3.3 COORDINATION MEETING

After the Preconstruction Conference, before start of construction, and prior to acceptance by the Government of the CQC Plan, the Contractor shall meet with the Contracting Officer or Authorized Representative and discuss the Contractor's quality control system. The CQC Plan shall be submitted for review a minimum of 14 calendar days prior to the Coordination Meeting. During the meeting, a mutual understanding of the system details shall be developed, including the forms for recording the CQC operations, control activities, testing, administration of the system for both onsite and offsite work, and the interrelationship of Contractor's Management and control with the Government's Quality Assurance. Minutes of the meeting shall be prepared by the Government and signed by both the Contractor and the Contracting Officer. The minutes shall become a part of the contract file. There may be occasions when subsequent conferences will be called by either party to reconfirm mutual understandings and/or address deficiencies in the CQC system or procedures which may require corrective action by the Contractor.

3.4 QUALITY CONTROL ORGANIZATION

3.4.1 General

The requirements for the CQC organization are a CQC System Manager and sufficient number of additional qualified personnel to ensure contract compliance. The Contractor shall provide a CQC organization which shall be at the site at all times during progress of the work and with complete authority to take any action necessary to ensure compliance with the contract. All CQC staff members shall be subject to acceptance by the Contracting Officer.

3.4.2 CQC System Manager

The Contractor shall identify as CQC System Manager an individual within his organization at the site of the work who shall be responsible for overall management of CQC and have the authority to act in all CQC matters for the Contractor. The CQC System Manager shall be a construction person with a minimum of 5 years in related work. This CQC System Manager shall be on the site at all times during construction and will be employed by the prime Contractor. The CQC System Manager shall be assigned no other duties. An alternate for the CQC System Manager will be identified in the plan to serve in the event of the System Manager's absence. The requirements for the alternate will be the same as for the designated CQC System Manager.

3.4.3 CQC Personnel

In addition to CQC personnel specified elsewhere in the contract, the Contractor shall provide as part of the CQC organization specialized personnel to assist the CQC System Manager for the following areas: civil and structural. These individuals shall be directly employed by the prime Contractor, unless waived in writing by the Contracting Officer; be responsible to the CQC System Manager; be physically present at the construction site during work on their areas of responsibility; have the necessary education and/or experience in accordance with the experience matrix listed herein. These individuals shall have no other duties other than quality control.

Experience Matrix

Area	Qualifications
a. Civil	Graduate Civil Engineer with 2 years experience in the type of work being performed on this project or technician with 5 yrs related experience
b. Structural	Graduate Structural Engineer with 2 yrs experience or person with 5 yrs related experience

3.4.4 Additional Requirement

In addition to the above experience and/or education requirements the CQC System Manager shall have completed the course entitled "Construction Quality Management For Contractors". This course is periodically offered by the Sacramento District, contact the Contracting Officer for more information.

3.4.5 Organizational Changes

The Contractor shall maintain his CQC staff at full strength at all times. When it is necessary to make changes to the CQC staff the Contractor shall revise the CQC Plan to reflect the changes and submit the changes to the Contracting Officer for acceptance.

3.5 SUBMITTALS

Submittals shall be made as specified in Section 01300 SUBMITTAL PROCEDURES. The CQC organization shall be responsible for certifying that all submittals are in compliance with the contract requirements.

3.6 CONTROL

Contractor Quality Control is the means by which the Contractor ensures that the construction, to include that of subcontractors and suppliers, complies with the requirements of the contract. At least three phases of control shall be conducted by the CQC System Manager for each definable feature of work as follows:

3.6.1 Preparatory Phase

This phase shall be performed prior to beginning work on each definable feature of work and shall include:

- a. A review of each paragraph of applicable specifications.
- b. A review of the contract drawings.
- c. A check to assure that all materials and/or equipment have been tested, submitted, and approved.
- d. Review of provisions that have been made to provide required control inspection and testing.
- e. Examination of the work area to assure that all required preliminary work has been completed and is in compliance with the contract.
- f. A physical examination of required materials, equipment, and sample work to assure that they are on hand, conform to approved shop drawings or submitted data, and are properly stored.
- g. A review of the appropriate activity hazard analysis to assure safety requirements are met.
- h. Discussion of procedures for controlling quality of the work including repetitive deficiencies. Document construction tolerances and workmanship standards for that feature of work.
- I. A check to ensure that the portion of the plan for the work to be performed has been accepted by the Contracting Officer.
- j. Discussion of the initial control phase.
- k. The Government shall be notified at least 48 hours in advance of beginning the preparatory control phase. This phase shall include a meeting conducted by the CQC System Manager and attended by the superintendent, other CQC personnel (as applicable), and the foreman responsible for the definable feature. The results of the preparatory phase actions shall be documented by separate minutes prepared by the CQC System Manager and attached to the daily CQC report. The Contractor shall instruct applicable workers as to the acceptable level of workmanship required in order to meet contract specifications.

3.6.2 Initial Phase

This phase shall be accomplished at the beginning of a definable feature of work. The following shall be accomplished:

- a. A check of work to ensure that it is in full compliance with contract requirements. Review minutes of the preparatory meeting.
- b. Verify adequacy of controls to ensure full contract compliance. Verify required control inspection and testing.
- c. Establish level of workmanship and verify that it meets minimum acceptable workmanship standards. Compare with required sample panels as appropriate.
- d. Resolve all differences.
- e. Check safety to include compliance with and upgrading of the safety plan and activity hazard analysis. Review the activity analysis with each worker.
- f. The Government shall be notified at least 48 hours in advance of beginning the initial phase. Separate minutes of this phase shall be prepared by the CQC System Manager and attached to the daily CQC report.

Exact location of initial phase shall be indicated for future reference and comparison with follow-up phases.

g. The initial phase should be repeated for each new crew to work onsite, or any time acceptable specified quality standards are not being met.

3.6.3 Follow-up Phase

Daily checks shall be performed to assure control activities, including control testing, are providing continued compliance with contract requirements, until completion of the particular feature of work. The checks shall be made a matter of record in the CQC documentation. Final follow-up checks shall be conducted and all deficiencies corrected prior to the start of additional features of work which may be affected by the deficient work. The Contractor shall not build upon or conceal non-conforming work.

3.6.4 Additional Preparatory and Initial Phases

Additional preparatory and initial phases shall be conducted on the same definable features of work if the quality of on-going work is unacceptable, if there are changes in the applicable CQC staff, onsite production supervision or work crew, if work on a definable feature is resumed after a substantial period of inactivity, or if other problems develop.

3.7 TESTS

3.7.1 Testing Procedure

The Contractor shall perform specified or required tests to verify that control measures are adequate to provide a product which conforms to contract requirements and notify the Contracting Officer's representative 24 hours prior to testing. Upon request, the Contractor shall furnish to the Government duplicate samples of test specimens for possible testing by the Government. Testing includes operation and/or acceptance tests when specified. The Contractor shall procure the services of a Corps of Engineers approved testing laboratory or establish an approved testing laboratory at the project site. The Contractor shall perform the following activities and record and provide the following data:

- a. Verify that testing procedures comply with contract requirements.
- b. Verify that facilities and testing equipment are available and comply with testing standards.
- c. Check test instrument calibration data against certified standards.
- d. Verify that recording forms and test identification control number system, including all of the test documentation requirements, have been prepared.
- e. Results of all tests taken, both passing and failing tests, will be recorded on the CQC report for the date taken. Specification paragraph reference, location where tests were taken, and the sequential control number identifying the test will be given. If approved by the Contracting Officer, actual test reports may be submitted later with a reference to the test number and date taken. An information copy of tests performed by an offsite or commercial test facility will be provided directly to the Contracting Officer. Failure to submit timely test reports as stated may result in nonpayment for related work performed and disapproval of the test facility for this contract.

3.7.2 Testing Laboratories

3.7.2.1 Capability Check

The Government reserves the right to check laboratory equipment in the proposed laboratory for compliance with the standards set forth in the contract specifications and to check the laboratory technician's testing procedures and techniques. Laboratories utilized for testing soils, concrete, asphalt, and steel shall meet criteria detailed in ASTM D 3740 and ASTM E 329.

3.7.3 On-Site Laboratory

The Government reserves the right to utilize the Contractor's control testing laboratory and equipment to make assurance tests and to check the Contractor's testing procedures, techniques, and test results at no additional cost to the Government.

3.7.4 Furnishing or Transportation of Samples for Testing

Costs incidental to the transportation of samples or materials will be borne by the Contractor. Samples of materials for test verification and acceptance testing by the Government shall be delivered to the Corps of Engineers Division Laboratory, f.o.b., at the following address:

For delivery by mail:

Director
South Pacific Division Laboratory
U.S. Army Corps of Engineers
25 Liberty Ship Drive
Sausalito, California 94965-1768

For other deliveries:

Director
South Pacific Division Laboratory
U.S. Army Corps of Engineers
Bridgeway, Foot of Spring St.
(Building directly east of 2000 Bridgeway)
Sausalito, California 94965

Coordination for each specific test, exact delivery location and dates will be made through the Area Office. The Contractor shall only submit those samples which are specifically designated to be sent to the SPD Lab. Notify the resident Contracting Officer Representative at least 14 days prior to delivery of samples.

3.8 COMPLETION INSPECTION

3.8.1 Pre-Final Inspection

At the completion of all work or any increment thereof established by a completion time stated in Section 00800, Paragraph "Commencement, Prosecution, and Completion of Work," or stated elsewhere in the specifications, the CQC System Manager shall conduct an inspection of the work and develop a "punch list" of items which do not conform to the approved drawings and specifications. Such a list of deficiencies shall be included in the CQC documentation, as required by paragraph DOCUMENTATION below, and shall include the estimated date by which the deficiencies will be corrected. Once this is accomplished the Contractor shall notify the Government that the facility is complete and is ready for the Government's "Prefinal" inspection. The Government will perform this inspection to verify that the facility is complete and ready to be occupied. A Government "Prefinal Punch List" will be developed as a result of this inspection. The Contractor's CQC System Manager shall ensure that all items on this list have been corrected and so notify the Government so that a "Final" inspection with the customer can be scheduled.

Any items noted on the "Final" inspection shall be corrected in a timely manner. These inspections and any deficiency corrections required by this paragraph will be accomplished within the time slated for completion of the entire work or any particular increment thereof if the project is divided into increments by separate completion dates.

3.8.2 Final Acceptance Inspection

The Contractor's Quality Control Inspection personnel, his superintendent or other primary management person and the Contracting Officer's Representative will be in attendance at this inspection. Additional Government personnel including, but not limited to, those from Base/Post Civil Facility Engineer user groups, and major commands may also be in attendance. The final acceptance inspection will be formally scheduled by the Contracting Officer based upon notice from the Contractor. This notice will be given to the Contracting Officer at least 14 days prior to the final acceptance inspection and must include the Contractor's assurance that all specific items previously identified to the Contractor as being acceptable, along with all remaining work performed under the contract, will be complete and acceptable by the date scheduled for the final acceptance inspection. Failure of the Contractor to have all contract work acceptably complete for this inspection will be cause for the Contracting Officer to bill the Contractor for the Government's additional inspection cost in accordance with Section 00800, Paragraph, "Inspection of Construction".

3.9 DOCUMENTATION

The Contractor shall maintain current records providing factual evidence that required quality control activities and/or tests have been performed. These records shall include the work of subcontractors and suppliers and shall be on an acceptable form that includes, as a minimum, the following information:

- a. Contractor/subcontractor and their area of responsibility.
- b. Operating plant/equipment with hours worked, idle, or down for repair.
- c. Work performed each day, giving location, description, and by whom. When Network Analysis (NAS) is used, identify each phase of work performed each day by NAS activity number.
- d. Test and/or control activities performed with results and references to specifications/drawings requirements. The control phase should be identified (Preparatory, Initial, Follow-up). List deficiencies noted along with corrective action.
- e. Quantity of materials received at the site with statement as to acceptability, storage, and reference to specifications/drawings requirements.
- f. Submittals reviewed, with contract reference, by whom, and action taken.
- g. Off-site surveillance activities, including actions taken.
- h. Job safety evaluations stating what was checked, results, and instructions or corrective actions.
- i. Instructions given/received and conflicts in plans and/or specifications.
- j. Contractor's verification statement.

These records shall indicate a description of trades working on the project; the number of personnel working; weather conditions encountered; and any delays encountered. These records shall cover both conforming and deficient features and shall include a statement that equipment and materials incorporated in the work and workmanship comply with the contract. The original and one copy of these records in report form shall be furnished to the Government daily within 24 hours after the date(s) covered by the report, except that reports need not be submitted for days on which no work is performed. As a minimum, one report shall be prepared and submitted for every seven days of no work and on the last day of a no work period. All calendar days shall be accounted for throughout the life of the contract. The first report following a day of no work shall be for that day only. Reports shall be signed and dated by the CQC System Manager. The report from the CQC System Manager shall include copies of test reports and copies of reports prepared by all subordinate quality control personnel.

3.10 IMPLEMENTATION OF GOVERNMENT RESIDENT MANAGEMENT SYSTEM

The Contractor shall utilize a Government furnished CQC Daily Report Form. This form may be in addition to other Contractor desired reporting forms. However, all other such reporting forms shall be consolidated into this one Government furnished Daily CQC Report Form. The Contractor will also be required to complete Government-Furnished Input Forms which lists, but is not limited to, Prime Contractor staffing; letter codes; planned cumulative progress earnings; subcontractor information showing trade, name, address, and insurance expiration dates; definable features of work; pay activity and activity information; required Quality Control tests tied to individual activities; planned User Schooling tied to specific specification paragraphs and Contractor activities; and submittal information relating to specification section, description, activity number, review period and expected procurement period. The sum of all activity values shall equal the contract amount, and all Bid Items shall be separately identified, in accordance with the PRICING SCHEDULE. These forms shall be completed to the satisfaction of the Contracting Officer prior to any contract payment (except for Bonds, Insurance and/or Mobilization, as approved by the Contracting Officer) and shall be updated as required.

a. During the course of the contract, the Contractor will receive various Quality Assurance comments from the Government that will reflect corrections needed to Contractor activities or reflect outstanding or future items needing the attention of the Contractor. The Contractor will acknowledge receipt of these comments by specific number reference on his Daily CQC Report and will also reflect on his Daily CQC report when these items are specifically completed or corrected.

b. The Contractor's schedule system shall include, as specific and separate activities, all Preparatory Phase Meetings (inspections); all O&M Manuals; and all Test Plans of Electrical and Mechanical Equipment or Systems that require validation testing or instructions to Government Representatives.

3.11 SAMPLE FORMS

Sample forms enclosed at the end of this section.

1. Test Report Form
2. Daily Contractor Quality Control Form
3. Preparatory Inspection Report Form
4. SPK 437 - Materials Test Summary

3.12 NOTIFICATION OF NONCOMPLIANCE

The Contracting Officer will notify the Contractor of any detected noncompliance with the foregoing requirements. The Contractor shall take

immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the worksite, shall be deemed sufficient for the purpose of notification. If the Contractor fails or refuses to comply promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to such stop orders shall be made the subject of claim for extension of time or for excess costs or damages by the Contractor in accordance with FAR 52.242-14.

-- End of Section --

(Sample of typical Contractor's Test Report)

TEST REPORT

STRUCTURAL OR BUILDING _____

CONTRACT NO. _____

DESCRIPTION OF ITEM, SYSTEM OR PART OF SYSTEM TESTED: _____

DESCRIPTION OF TEST: _____

NAME AND TITLE OF PERSON IN CHARGE OF PERFORMING TESTS FOR CONTRACTOR:

NAME _____

TITLE _____

SIGNATURE _____

I HEREBY CERTIFY THAT THE ABOVE DESCRIBED ITEM, SYSTEM OR PART OF SYSTEM HAS BEEN TESTED AS INDICATED ABOVE AND FOUND TO BE ENTIRELY SATISFACTORY AS REQUIRED IN THE CONTRACT SPECIFICATIONS.

SIGNATURE OF CONTRACTOR QUALITY CONTROL INSPECTOR
DATE _____

REMARKS: _____

(Sample of Typical DAILY CONSTRUCTION QUALITY CONTROL REPORT)

CONTRACTOR'S NAME
(Address)

DAILY CONSTRUCTION QUALITY CONTROL REPORT

Date: _____ Report No. _____

Contract No.: _____

Name and Location of Project: _____

WEATHER: (Clear) (P. Cloudy) (Cloudy) Temperature: _____

Rainfall _____ Inches Min., _____ Max., _____

Contractor/Subcontractors	Area of Responsibility
a. _____	_____
b. _____	_____
c. _____	_____
d. _____	_____
e. _____	_____
f. _____	_____
g. _____	_____

1. WORK PERFORMED TODAY: (Indicate location and description of work performed. Refer to work performed by prime and/or subcontractors by letter in Table above.)

2. PREPARATORY INSPECTION FOR NEXT ITEM OF WORK: (Materials/shop drawings approved, required control testing arranged, all preliminary work has been accomplished as per plans and specifications.)

3. INITIAL INSPECTION: (Address quality of workmanship, assure control testing and materials being used in all work are in compliance with plans and specifications).

4. FOLLOW-UP INSPECTIONS: (Assure control testing performed as required and all work performed continues to be in compliance with plans and specifications).

5. VERBAL INSTRUCTIONS RECEIVED: (List any instructions given by Government personnel on construction deficiencies, retesting required, etc., with action to be taken.)

6. REMARKS: (Cover any conflicts in plans, specifications, or instructions or any delay to the job attributable to weather conditions.)

7. RESULTS OF SAFETY INSPECTION: (Note safety violations and corrective action taken. Indicate phase of work where violations occurred.)

8. UPCOMING WORK: (Indicate next major phase of work anticipated and approximate date of Preparatory Inspection meeting to cover this work.)

EQUIPMENT DATA: (Indicate items of construction equipment, other than hand tools, at the job site and whether or not used.)

CONTRACTOR'S VERIFICATION: The above report is complete and correct and all material and equipment used and work performed during this reporting period area in compliance with the contract plans and specifications except as noted above.

Contractor's Approved/Authorized
Representative

(Sample of Typical Form)
PREPARATORY INSPECTION OUTLINE
(PART-I)

Contract No.: _____ Date: _____

Title and No. of Technical Section: _____

Reference Contract Drawings: _____

A. PLANNED ATTENDANTS:

	<u>NAME</u>	<u>POSITION</u>	<u>COMPANY</u>
1.	_____	_____	_____
2.	_____	_____	_____
3.	_____	_____	_____
4.	_____	_____	_____

B. SUBMITTALS REQUIRED TO BEGIN WORK:

	<u>ITEM</u>	<u>SUBMITTAL NO.</u>	<u>ACTION CODE</u>
a.	_____	_____	_____
b.	_____	_____	_____
c.	_____	_____	_____
d.	_____	_____	_____

I HEREBY DECLARE THAT THE ABOVE REQUIRED MATERIALS DELIVERED TO THE JOBSITE ARE CERTIFIED TO BE THE SAME AS THOSE SUBMITTED AND APPROVED.

QUALITY CONTROL REPRESENTATIVE

C. EQUIPMENT TO BE USED IN EXECUTING WORK:

a.	_____
b.	_____
c.	_____

D. WORK AREAS EXAMINED TO ASCERTAIN THAT ALL PRELIMINARY WORK HAS BEEN COMPLETED:

E. METHODS AND PROCEDURES FOR PERFORMING QUALITY CONTROL - INCLUDING SPECIFIC TESTING REQUIREMENTS:

F. COMPLIANCE WITH AND UPGRADING OF THE SAFETY PLAN AND ACTIVITY HAZARD ANALYSIS INCLUDING REVIEW OF THE ACTIVITY ANALYSIS WITH EACH WORKER:

THE ABOVE METHODS AND PROCEDURES OUTLINED ARE CERTIFIED TO COMPLY WITH THE CONTRACT REQUIREMENTS AND WILL BE PERFORMED AS PLANNED AND SPECIFIED.

QUALITY CONTROL REPRESENTATIVE

(Sample of Typical Form)

PREPARATORY INSPECTION OUTLINE
(PART - II)

A. PERSONS IN ATTENDANCE:

	<u>NAME</u>	<u>POSITION</u>	<u>COMPANY</u>
1.	_____	_____	_____
2.	_____	_____	_____
3.	_____	_____	_____
4.	_____	_____	_____
5.	_____	_____	_____
6.	_____	_____	_____

B. ITEMS OF MUTUAL UNDERSTANDING DEVELOPED DURING REVIEW OF PREPARATORY OUTLINE AND CONTRACT REQUIREMENTS: (Contract items not specifically covered during the preparatory inspection conference are assumed to be in strict conformance with the contract requirements.)

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

8. _____

THE ITEMS NOTED ABOVE CONSTITUTE A MEMORANDUM OF MUTUAL UNDERSTANDING AND WILL BE PERFORMED AS PLANNED AND SPECIFIED.

CONTRACTOR'S APPROVED/AUTHORIZED REPRESENTATIVE

(Sample of Typical Form)

INITIAL PHASE CHECK LIST

Contract No.: _____ Date: _____

Specification Paragraph or Section: _____

Description and Location of Work Inspected: _____

REFERENCE CONTRACT DRAWINGS: _____

A. PERSONNEL PRESENT:

	<u>NAME</u>	<u>POSITION</u>	<u>COMPANY</u>
1.	_____	_____	_____
2.	_____	_____	_____
3.	_____	_____	_____
4.	_____	_____	_____

B. MATERIALS BEING USED ARE IN STRICT COMPLIANCE WITH THE CONTRACT PLANS AND SPECIFICATIONS: YES _____ NO _____

IF NOT, EXPLAIN: _____

C. PROCEDURES AND/OR WORK METHODS WITNESSED ARE IN STRICT COMPLIANCE WITH THE CONTRACT SPECIFICATIONS: YES _____ NO _____

IF NOT, EXPLAIN: _____

D. WORKMANSHIP IS ACCEPTABLE: YES _____ NO _____

STATE AREAS WHERE IMPROVEMENT IS NEEDED: _____

E. SAFETY VIOLATIONS NOTED: YES _____ NO _____

IF YES, CORRECTIVE ACTION TAKEN: _____

QUALITY CONTROL REPRESENTATIVE

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SECTION 01500

TEMPORARY CONSTRUCTION FACILITIES

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SECTION 01500

TEMPORARY CONSTRUCTION FACILITIES

PART 1 GENERAL

1.1 APPLICABLE PUBLICATIONS:

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

DEPARTMENT OF COMMERCE (DOC)

- DOC PS 1 (1983) Construction and Industrial Plywood
- DOC PS 20 (1970) American Softwood Lumber Standard.

FEDERAL SPECIFICATIONS (FS)

- FS TT-P-001984 (Basic) Primer Coating, Latex Base, Exterior, (Undercoat for Wood), White and Tints

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

- ANSI Z535.1 (1991) Safety Color Code

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- ASTM F 547 (1977; R 1990) Definitions of Terms Relating to Nails for Use with Wood and Wood-Base Materials

U.S. ARMY CORPS OF ENGINEERS

- EM 385-1-1 Safety and Health Requirements Manual (3 September 1996).

WEST COAST LUMBER INSPECTION BUREAU (WCLIB)

- WCLIB 16 (1970; Rev 1983) Standard Grading and Dressing Rules for Douglas Fir, Western Hemlock, Western Red Cedar, White Fir, Sitka Spruce Lumber

WESTERN WOOD PRODUCTS ASSOCIATION (WWPA)

- WWPA-01 (1991; Supple No. 1) Western Lumber Grading Rules 91

1.2 GENERAL REQUIREMENTS

1.2.1 Site Plan

The Contractor shall prepare a site plan indicating the proposed location and dimensions of any area to be fenced and used by the Contractor, the number of trailers to be used, avenues of ingress/egress to the fenced area and details of the fence installation. Any areas which may have to be graveled to prevent the tracking of mud shall also be identified. The Contractor shall also indicate if the use of a supplemental or other staging area is desired.

1.2.2 Identification of Employees

The Contractor shall be responsible for furnishing to each employee and for requiring each employee engaged on the work to display identification as approved and directed by the Contracting Officer. Prescribed identification shall immediately be delivered to the Contracting Officer for cancellation upon release of any employee. When required, the Contractor shall obtain and provide fingerprints of persons employed on the project. Contractor and subcontractor personnel shall wear identifying markings on hard hats clearly identifying the company for whom the employee works.

1.2.3 Employee Parking

Contractor employees shall park privately owned vehicles in an area designated by the Contracting Officer. This area will be within reasonable walking distance of the construction site. Contractor employee parking shall not interfere with existing and established parking requirements of the military installation.

1.3 AVAILABILITY AND USE OF UTILITY SERVICES

1.3.1 Payment for Utility Services

The Government will make all reasonably required utilities available to the Contractor from existing outlets and supplies, as specified in the contract. The Contractor shall carefully conserve any utilities furnished without charge. The Contractor's attention is directed to Section 00800, Paragraph AVAILABILITY OF UTILITY SERVICES.

1.3.2 Sanitation

The Contractor shall provide and maintain within the construction area minimum field-type sanitary facilities approved by the Contracting Officer. Government toilet facilities will not be available to Contractor's personnel.

1.3.3 Telephone

The Contractor shall make arrangements and pay all costs for telephone facilities desired.

1.4 BULLETIN BOARD, PROJECT SIGN, AND PROJECT SAFETY SIGN

1.4.1 Bulletin Board

Immediately upon beginning of work, the Contractor shall provide a weatherproof glass-covered bulletin board not less than 915 by 1220 mm (36 by 48 inches) in size for displaying the Equal Employment Opportunity poster, a copy of the wage decision contained in the contract, Wage Rate Information poster, and other information approved by the Contracting Officer. The bulletin board shall be located at the project site in a conspicuous place easily accessible to all employees, as approved by the Contracting Officer. Legible copies of the aforementioned data shall be displayed until work is completed. Upon completion of work the bulletin board shall be removed by and remain the property of the Contractor.

(A) General:

The Contractor shall construct and erect one project sign, one safety sign and a minimum of 1 hard hat signs at locations designated by the Contracting Officer. The signs shall conform to the requirements of the drawings attached at the end of this section. The signs shall be erected as soon as possible and within 15 days after date of commencement of work under this contract. The data required by the safety sign shall be corrected daily.

(B) Materials:

(1) Lumber shall conform to DOC PS 20 and grading rules of applicable grading agencies, WCLIB or WWPA. Grade shall be "Standard" or better Douglas Fir, S4S and shall be stamped S-Dry.

(2) Plywood: Plywood shall conform to DOC PS 1, Grade AC, Group 1, Exterior.

(3) Bolts, Nuts and Nails: Bolts and nuts shall be galvanized, and type, and size best suited for intended for use. Nails shall conform to ASTM F 547.

(4) Paint: Type of paint for primer, finish coats, lettering, and color of signs and lettering shall be as directed by the Contracting Officer. Safety signs shall be painted in the same colors as the project sign. Hard hat signs shall be painted as indicated on the attached drawing.

(5) Decals: Corps of Engineers castle decal and the hard hat decal called for on the signs will be furnished by the Government.

(C) Construction:

(1) Signs shall be constructed as detailed on attached drawings.

(2) Painting: All exposed surfaces and edges of plywood shall be given one coat of linseed oil and be wiped prior to applying primer. All exposed surfaces of signs and supports shall be given one coat of primer and one finish coat of paint colors as directed. All lettering shall be sized as indicated. Width of letter stroke shall be 1/6 of the letter height, except as noted.

(D) Maintenance and Disposal:

The Contractor shall maintain the signs in good condition throughout the life of the project. Signs shall remain the property of the Contractor and upon completion of the project they shall be removed from the site.

1.5 SCRAP MATERIAL:

Materials specified to be removed and become the property of the Contractor are designated as scrap, and the Contractor, by signing this contract, hereby acknowledges that he has made due allowance for value, if any, of such scrap in the contract price.

1.6 WRITTEN GUARANTEES AND GUARANTOR'S LOCAL REPRESENTATIVE:

Prior to completion of the contract, the Contractor shall obtain and furnish to the Contracting Officer's representative written guarantees for all the equipment and/or appliances furnished under the contract. The Contractor shall furnish with each guarantee: The name, address, and telephone number of the guarantor's representative nearest to the location where the equipment and/or appliances are installed, who, upon request of the Using Service's representative, will honor the guarantee during the guaranty period and will provide the services prescribed by the terms of the guarantee.

1.7 PRICING OF CONTRACTOR-FURNISHED PROPERTY:

At the request of the Contracting Officer, the Contractor shall promptly furnish and shall cause any subcontractors to furnish, in like manner, unit prices and descriptive data required by the Government for property record purposes of fixtures and equipment furnished and installed by the Contractor.

1.8 TEMPORARY ELECTRIC WIRING:

(A) Temporary Power and Lighting:

The Contractor shall provide construction power facilities in accordance with the safety requirements of the National Electrical Code NFPA No. 70 and the SAFETY AND HEALTH REQUIREMENTS MANUAL EM 385-1-1. The Contractor, or his delegated subcontractor, shall enforce all the safety requirements of electrical extensions for the work of all subcontractors. All work shall be accomplished by skilled electrical tradesmen in a workmanlike manner, as approved by the Contracting Officer.

(B) Construction Equipment:

In addition to the requirements of EM 385-1-1, SAFETY AND HEALTH REQUIREMENTS MANUAL, all temporary wiring conductors installed for operation of construction tools and equipment shall be either Type TW or THW contained in metal raceways, or may be multiconductor cord. Temporary wiring shall be secured above the ground or floor in a workmanlike manner and shall not present an obstacle to persons or equipment. Open wiring may only be used outside of buildings, and then only in strict accordance with the provisions of the National Electrical Code.

(C) Circuit Protection:

In addition to the present requirements in EM 385-1-1 and the National Electrical Code, all 15 and 20-ampere receptacle outlets used for obtaining power during construction shall have ground fault circuit interrupters (GFCI) for personnel protection. Block and brick saws shall also be equipped with GFCI. The Contracting Officer may allow an exception to this requirement for circuits for concrete vibrators or circuits operating at other than 60 Hertz normal (in both cases an assured grounding program as described in the National Electrical Code, except utilizing the daily inspection frequency of the grounding means of such equipment, may be permitted). The assured grounding program will not be permitted as a substitute for usage of GFCI'S except as described above. All generator-powered 15- and 20-ampere, 60 Hertz receptacle outlets shall have GFCI'S, and shall be properly grounded. A testing means shall be provided which will impose a measured fault of 5 milliamperes, plus or minus 1 milliamperes, and result in tripping the GFCI unit.

1.9 UTILITIES NOT SHOWN:

If the Contractor encounters, within the construction limits of the entire project, utilities not shown on the plans and not visible as to the date of this contract and such utilities will interfere with construction operations, he shall immediately notify the Contracting Officer in writing to enable a determination by the Contracting Officer as to the necessity for removal or relocation. If such utilities are removed or relocated as directed by the Contracting Officer, the Contractor shall be entitled to equitable adjustment for any additional pertinent work or delay. Any digging or work which may affect the communication lines for the base must be cleared through the 75 CS/CC, Mr. Kevin Forbes, Base Civil Engineering, ext 7-1190, and 75 SFS/SFAI, Ms. Linda Lee, ext 7-5532. A notice of intent, minimum of one week prior to commencement of work, will be on file with the respective offices.

1.10 GENERAL SAFETY REQUIREMENTS:

(A) General:

The Corps of Engineers Safety and Health Requirements Manual, EM 385-1-1, (see Contract Clauses, Section 00700, ACCIDENT PREVENTION) and the Occupational Safety and Health Act (OSHA) Standards for Construction (Title 29, Code of Federal Regulations Part 1926 as revised from time to time); General

Industry Standards (Title 29, Code of Federal Regulations Part 1910 as revised from time to time); and the National Fire Protection Association Codes are applicable to this contract. In case of conflict the most stringent requirement of the standards is applicable.

(B) The Prime Contractor's superintendent

The Prime Contractor's superintendent shall take an active role in enforcing the safety requirements by participation in safety conferences, hazard analysis (see below), tool box meetings, walk-through inspections, correction of violations, etc., and including that of the subcontractor's work.

(C) Job Hazard Analysis:

Based on the construction schedule, the Contractor shall submit a job hazard analysis of each major phase of work prior to entering that phase of activity. The analysis shall include major or high risk hazards, as well as commonly recurring deficiencies that might possibly be encountered for that operation, and shall identify proposed methods and techniques of accomplishing each phase in a safe manner. The Prime Contractor's superintendent shall take active participation in the Job Hazard Analysis, including the subcontractors' work. Prior to start of actual work a meeting shall be held with Prime Contractor, Government, and affected subcontractor to review the Job Hazard Analysis. In addition, job site meetings shall be held to indoctrinate foreman and workers on details of this analysis.

(D) Violations:

If recurring violations and/or gross violation indicate that the safety performance is unsatisfactory, corrective action shall be taken as directed, and at the discretion of the Contracting Officer the retention or some part thereof will be withheld from the progress payment until corrective action has been completed.

(E) Fire Prevention:

Twenty-four hours notice shall be given to the Contracting Officer for coordination with the Facility Fire Department prior to conducting any fire hazardous operation. Cutting or welding will be permitted only in areas that are or have been made fire safe. Where possible, all combustibles shall be located at least 35 feet horizontally from the work site. Where such location is impracticable, combustibles shall be protected with fire blankets and/or protective welding screens to prevent slag from running out of the work area. Edges of covers at the floor shall be tight to prevent sparks from going under them. This precaution is also important at overlaps where several covers are used to protect a large pile. The Contractor shall not allow any welding/cutting or open flame operations in facilities that are protected by a wet pipe fire sprinkler or an automatic detection system, if the system is out of service. First priority of work will be to return the suppression/detection system to operational condition. Return the fire detection and/or suppression system back to an operational status (if possible) during periods that the facility is unoccupied, and at the end of the work day. The Contractor shall post a fire guard for a 24 hour period (or certify to the Fire Department that the facility is safe) after welding, cutting, and open flame operations in a facility when: (a) fire detection and suppression system can not be returned to service; (b) fire detection or suppression systems do not exist. Other fire prevention precautions shall be in accordance with the latest National Fire Codes.

(F) Recordkeeping/Reporting Requirements:

On all contract operations, the Prime Contractor shall be responsible for recording and reporting all accident exposure and experience incident work.

(This includes exposure and experience of the prime contractor and his/her sub-contractor(s)). As a minimum these records shall include exposure work-hours and a log of occupational injuries and illnesses. (OSHA Form 200 or state equivalent as prescribed by 29 CFR 1904.5) Reference EM 385-1-1, 02.A.02.

(G) Accident Reporting:

In addition to the requirements for reporting accidents in accordance with EM 385-1-1, Section 1, the Prime Contractor will submit at the 50% point and 100% of project completion, a written summary of worker's compensation claims filed by workers on the project. The report will include all subcontractors. The main report covering the Prime Contractor claims will be certified as "correct and true" by the Contractor's compensation insurance carrier. The same certification will be required for subcontractor reports.

1.11 PLANNED UTILITY OUTAGES AND STREET CLOSURES:

All utility outages and street closures shall be of as short a duration as possible and shall be scheduled as far in advance as possible with the Contracting Officer, in no case less than (7) days before the outage or closure. The Contractor shall obtain in writing from the Contracting Officer a statement or schedule giving the permissible times of outages or closures for particular installations and the maximum time allowed for each. The Contractor shall strictly observe such schedules and will be held responsible for any violations.

1.12 PROTECTION AND MAINTENANCE OF TRAFFIC

During construction the Contractor shall provide access and temporary relocated roads as necessary to maintain traffic. The Contractor shall maintain and protect traffic on all affected roads during the construction period except as otherwise specifically directed by the Contracting Officer. Measures for the protection and diversion of traffic, including the provision of watchmen and flagmen, erection of barricades, placing of lights around and in front of equipment and the work, and the erection and maintenance of adequate warning, danger, and direction signs, shall be as required by the State and local authorities having jurisdiction. The traveling public shall be protected from damage to person and property. The Contractor's traffic on roads selected for hauling material to and from the site shall interfere as little as possible with public traffic. The Contractor shall investigate the adequacy of existing roads and the allowable load limit on these roads. The Contractor shall be responsible for the repair of any damage to roads caused by construction operations.

1.12.1 Haul Roads

The Contractor shall, at its own expense, construct access and haul roads necessary for proper prosecution of the work under this contract. Haul roads shall be constructed with suitable grades and widths; sharp curves, blind corners, and dangerous cross traffic shall be avoided. The Contractor shall provide necessary lighting, signs, barricades, and distinctive markings for the safe movement of traffic. The method of dust control, although optional, shall be adequate to ensure safe operation at all times. Location, grade, width, and alignment of construction and hauling roads shall be subject to approval by the Contracting Officer. Lighting shall be adequate to assure full and clear visibility for full width of haul road and work areas during any night work operations. Upon completion of the work, haul roads designated by the Contracting Officer shall be removed.

1.12.2 Barricades

The Contractor shall erect and maintain temporary barricades to limit public access to hazardous areas. Such barricades shall be required whenever safe public access to paved areas such as roads, parking areas or sidewalks is

prevented by construction activities or as otherwise necessary to ensure the safety of both pedestrian and vehicular traffic. Barricades shall be securely placed, clearly visible with adequate illumination to provide sufficient visual warning of the hazard during both day and night.

1.13 EXCAVATION PERMITS:

(A) No excavation shall be done prior to receiving a Base Civil Engineering Excavation Permit. Permits will be obtained from the Red Stake Office in Civil Engineering, Building 15. If excavation is started without obtaining a permit, the contractor shall be held liable for repairs of any broken utility lines or other damage resulting from the broken lines.

(B) The contractor shall request a permit 14 calendar days prior to scheduled start of digging.

(C) Hand digging shall be required to locate utilities shown on the contract drawings, Excavation Permit, or 3 feet (1 meter) on either side of locations identified by Base Maintenance Shops.

(D) The contractor shall be responsible for identifying all lawn sprinkler system components within the excavation area. Any components damaged during the course of construction shall be repaired by the contractor at his expense. Any damage to landscaping as a result of contractor damage to sprinkler system components shall also be repaired by the contractor at his expense.

(E) Protection of existing utilities shall be provided in accordance with Construction Clause entitled Protection of Existing Vegetation, Structures, Equipment, Utilities, and Improvements (FAR 52.236-9).

1.14 TIME EXTENSIONS FOR UNUSUALLY SEVERE WEATHER:

(A) This provision specifies the procedure for the determination of time extensions for unusually severe weather in accordance with the CONTRACT CLAUSE, Section 00700, entitled "DEFAULT (FIXED-PRICE CONSTRUCTION)". In order for the Contracting Officer to award a time extension under this clause, the following conditions must be satisfied:

(1) The weather experienced at the project site during the contract period must be found to be unusually severe, that is, more severe than the adverse weather anticipated for the project location during any given month.

(2) The unusually severe weather must actually cause a delay to the completion of the project. The delay must be beyond the control and without the fault or negligence of the Contractor.

(B) The following schedule of monthly anticipated adverse weather delays is based on National Oceanic and Atmospheric Administration (NOAA) or similar data for the project location and will constitute the base line for monthly weather time evaluations. The Contractor's progress schedule must reflect these anticipated adverse weather delays in all weather dependent activities.

MONTHLY ANTICIPATED ADVERSE WEATHER DELAY WORK DAYS BASED ON (5) DAY WORK WEEK

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
(22)	(17)	(13)	(08)	(05)	(03)	(01)	(02)	(03)	(05)	(12)	(22)

1.15 CONTRACTOR'S TEMPORARY FACILITIES

1.15.1 Administrative Field Offices

The Contractor shall provide and maintain administrative field office facilities within the construction area at the designated site. Government office and warehouse facilities will not be available to the Contractor's personnel.

1.15.2 Storage Area

The Contractor shall construct a temporary 1.8 meter (6 foot) high chain link fence around trailers and materials. If government property is included with the contractors, the contractor must secure it also, and notify the contracting officer/engineer as soon as possible. The fence shall include plastic strip inserts, colored brown, so that visibility through the fence is obstructed. Fence posts may be driven, in lieu of concrete bases, where soil conditions permit. Trailers, materials, or equipment shall not be placed or stored outside the fenced area unless such trailers, materials, or equipment are assigned a separate and distinct storage area by the Contracting Officer away from the vicinity of the construction site but within the military boundaries. Trailers, equipment, or materials shall not be open to public view with the exception of those items which are in support of ongoing work on any given day. Materials shall not be stockpiled outside the fence in preparation for the next day's work. At the end of each work day mobile equipment, such as tractors, wheeled lifting equipment, cranes, trucks, and like equipment, shall be parked within the fenced area.

1.15.3 Supplemental Storage Area

Upon Contractor's request, the Contracting Officer will designate another or supplemental area for the Contractor's use and storage of trailers, equipment, and materials. This area may not be in close proximity of the construction site but shall be within the military boundaries. Fencing of materials or equipment will not be required at this site; however, the Contractor shall be responsible for cleanliness and orderliness of the area used and for the security of any material or equipment stored in this area. Utilities will not be provided to this area by the Government.

1.15.4 Appearance of Trailers

Trailers utilized by the Contractor for administrative or material storage purposes shall present a clean and neat exterior appearance and shall be in a state of good repair. Trailers which, in the opinion of the Contracting Officer, require exterior painting or maintenance will not be allowed on **the military property**.

1.15.5 Maintenance of Storage Area

Fencing shall be kept in a state of good repair and proper alignment. Should the Contractor elect to traverse with construction equipment or other vehicles grassed or unpaved areas which are not established roadways, such areas shall be covered with a layer of gravel as necessary to prevent rutting and the tracking of mud onto paved or established roadways; gravel gradation shall be at the Contractor's discretion. Grass located within the boundaries of the construction site shall be mowed for the duration of the project. Grass and vegetation along fences, buildings, under trailers, and in areas not accessible to mowers shall be edged or trimmed neatly.

1.15.6 Security Provisions

Adequate outside security lighting shall be provided at the Contractor's temporary facilities. The Contractor shall be responsible for the security of its own equipment; in addition, the Contractor shall notify the appropriate law

enforcement agency requesting periodic security checks of the temporary project field office.

1.16 TEMPORARY PROJECT SAFETY FENCING

As soon as practicable, but not later than 15 days after the date established for commencement of work, the Contractor shall furnish and erect temporary project safety fencing at the work site. The safety fencing shall be a high visibility orange colored, high density polyethylene grid or approved equal, a minimum of 1.07 meters (42 inches) high, supported and tightly secured to steel posts located on maximum 3 meters (10 foot) centers, constructed at the approved location. The safety fencing shall be maintained by the Contractor during the life of the contract and, upon completion and acceptance of the work, shall become the property of the Contractor and shall be removed from the work site.

1.17 HOUSEKEEPING AND CLEANUP:

Pursuant to the requirements of paragraph, CLEANING UP and paragraph, ACCIDENT PREVENTION, of the CONTRACT CLAUSES, Section 00700, the Contractor shall assign sufficient personnel to insure strict compliance. The Contractor shall submit a detailed written plan for implementation of this requirement. The plan will be presented as part of the preconstruction safety plan and will provide for keeping the total construction site, structures and accessways free of debris and obstructions at all times. Work will not be allowed in those areas that, in the opinion of the Contracting Officer's representative, have unsatisfactory cleanup and housekeeping at the end of the preceding day's normal work shift. At least once each day all areas shall be checked by the Quality Control person of the Prime Contractor and the findings recorded on the Quality Control Daily Report. In addition, the Quality Control person will take immediate action to insure compliance with this requirement. Housekeeping and cleanup shall be assigned by the Contractor to specific personnel. The name(s) of the personnel shall be available at the project site; each person will be supplied with a distinctively marked hard hat, to be worn from the beginning to the end of the project.

1.18 RESTORATION OF STORAGE AREA

Upon completion of the project and after removal of trailers, materials, and equipment from within the fenced area, the fence shall be removed and will become the property of the Contractor. Areas used by the Contractor for the storage of equipment or material, or other use, shall be restored to the original or better condition. Gravel used to traverse grassed areas shall be removed and the area restored to its original condition, including top soil and seeding as necessary.

1.19 EQUIPMENT OWNERSHIP AND OPERATING EXPENSE SCHEDULE

(A) Allowable cost for construction and marine plant and equipment in sound workable condition owned or controlled and furnished by a Contractor or subcontractor at any tier shall be based on actual cost data when the Government can determine both ownership and operating costs for each piece of equipment or equipment groups of similar serial and series from the Contractor's accounting records. When both ownership and operating costs cannot be determined from the Contractor's accounting records, equipment costs shall be based upon the applicable provisions of EP 1110-1-8, "Construction Equipment Ownership and Operating Expense Schedule", Region VII. Working conditions shall be considered to be average for determining equipment rates using the schedule unless specified otherwise by the Contracting Officer. For equipment not included in the schedule, rates for comparable pieces of equipment may be used or a rate may be developed using the formula provided in the schedule. For forward pricing, the schedule in effect at the time of negotiations shall apply. For retrospective pricing, the schedule in effect at the time the work was performed shall apply.

(B) Equipment rental costs are allowable, subject to the provisions of FAR 31.105(d)(ii) and FAR 31.205-36 substantiated by certified copies of paid invoices. Rates for equipment rented from an organization under common control, lease-purchase or sale-leaseback arrangements will be determined using the schedule except that rental costs leased from an organization under common control that has an established practice of leasing the same or similar equipment to unaffiliated leasees are allowable. Costs for major repairs or overhaul are unallowable.

(C) When actual equipment costs are proposed and the total amount of the pricing action is over \$25,000, cost or pricing data shall be submitted on Standard Form 1411, "Contract Pricing Proposal Cover Sheet". By submitting cost or pricing data, the Contractor grants to the Contracting Officer or an authorizing representative the right to examine those books, records, documents and other supporting data that will permit evaluation of the proposed equipment costs. After price agreement, the Contractor shall certify that the equipment costs or pricing data submitted are accurate, complete and current.

1.20 EQUIPMENT DATA FORM

In conjunction with paragraph, EQUIPMENT OWNERSHIP AND OPERATING EXPENSE SCHEDULE, above the Contractor shall furnish SPK Form 450 for all necessary equipment to perform work requiring adjustment of contract price and shall submit these forms with the modification proposals. A sample form is at the end of this section.

1.21 SPECIAL CONSTRUCTION REQUIREMENTS:

(A) Utility Line Marking

(1) Contractor shall provide and install a trace wire of #6 insulated copper wire within one foot of all new utilities (except electrical lines) placed underground at Hill Air Force Base.

(2) If length of new utility is 500 feet or less contractor shall install one terminal box of 2" diameter pipe at each end of the wire marking the utility location.

(3) If length of new utility is greater than 500 feet, contractor shall place terminal boxes at 500 foot intervals.

(4) Terminal boxes (Handley Industries or approved equal) shall have a metal screw-on type lid mounted flush with pavement or raised above the existing ground elevation, as determined by the project manager.

(B) Security Provisions

(1) Any removal or changing of security fixtures must be cleared through 75 SFS/SFO and SFAI, at ext 7-5531 and 7-5489.

(2) Any facility construction or remodeling, which effect any enhanced security measures, must be coordinated with the owner/user and the Security Forces Sq., one week prior to commencement of work. POC is 75 SFS/SFAI, Mr. Woodall, ext 7-6617.

(3) No Foreign Nationals may be employed by the Contractor without first clearing through the Foreign Disclosure Office, ext 7-6858.

(4) Any special security requirements needed for the contractor, should be coordinated through Ms, Donalene Knowley, 75 SFS/SFAI, ext 7-7811.

1.22 SOIL DENSITY TEST (USING METERS CONTAINING RADIOACTIVE MATERIALS):

Nuclear methods are not acceptable for soil and soil-aggregate density tests required by this contract except as stated in DIVISION 2. Testing for official results shall be conducted as specified in DIVISION 2 of this contract. If the Contractor proposes to use meters containing radioactive materials to obtain unofficial results for his own convenience, the Contractor shall adhere to the following requirements:

(A) A USAF Radioactive Material Permit shall be obtained prior to work being performed.

(B) The Contractor shall contact the installation Radiation Protection Officer (RPO) at least 45 days prior to intended use so adequate time is provided for processing the paperwork and obtaining the USAF Radioactive Material Permit.

(C) The Contractor shall notify the RPO before bringing the radioactive material onto the installation and must notify the RPO when radioactive material is removed. The Contractor shall ensure that the RPO, installation fire department, and safety office know the locations where the material will be stored and used.

(D) The Contractor shall comply with the requirements of his/her NRC or Agreement State license and the USAF Radioactive Material Permit.

(E) The Installation RPO will periodically check the use of the radioactive material to ensure proper radiological health precautions are being followed. If the RPO discovers improper radiological procedures, the RPO will immediately notify the contract monitor to initiate corrective actions.

(F) Applications for USAF Radioactive Material Permits are submitted as follows:

(1) All applications for permits shall be submitted to host base RPO for review and approval of qualified users to work on Air Force installations.

(2) Requests will be submitted in duplicate to RPO and will include:

a. Evidence of a valid Nuclear Regulatory Commission (NRC) or Agreement State Radioactive Material License.

b. A copy of an NRC Form 241, or a similar document (such as a letter), listing the specific licensable items the Contractor wishes to use on the base (in the case of an Agreement State licensee, the original must be forwarded by the Contractor to the appropriate NRC region).

c. Proof of a valid Air Force contract.

(3) Non-Air Force organizations which possess Agreement State licenses must forward an NRC Form 241 directly to the applicable NRC regional office as well as to the committee (Reference Title 10, Code of Federal Regulations, Part 150.20). Agreement State licenses are valid for only 180 calendar days per calendar year. If the non-Air Force organization that possesses the Agreement State license wishes to conduct operations on the Air Force installation for more than 180 days per year, it must apply for and be issued an NRC license before a permit may be issued.

(G) Renewal or termination of a USAF Radioactive Material Permit is processed as follows:

(1) Non-Air Force organizations must formally apply for either a renewal or termination of their permit upon its expiration. Permits do not automatically terminate upon reaching their expiration date but remain active pending final disposition of the radioactive material.

(2) If the original contract is renewed or continued, then an application for renewal must contain the same information as the initial request.

(3) If work under the contract has been completed, the non-Air Force organization shall submit a formal application to terminate the permit. This application shall include appropriate disposal documents and radiation survey data to confirm that the radioactive materials have been removed from the installation. (AFR 161-16)

1.23 CONTRACTOR SAFETY PERSONNEL REQUIREMENTS: (1985 JAN HQ USACE)

(A) Full-time, on-site, safety coverage by contractors shall be required for the life of the contract.

(B) The following conditions shall be met:

(1) The Contractor shall employ, to cover all hours of work at the project site(s), at least one safety and health person to manage the Contractor's safety program; duties which are not germane to the safety program shall not be assigned to this person(s). The principal safety and health person shall report to and work directly for the Contractor's top on-site manager, corporate safety office, or other high-level official of equivalent position. The safety and health person(s) shall have the authority to take immediate steps to correct unsafe or unhealthful conditions. The employment of a safety and health person(s) shall not abrogate the safety and health responsibilities of other personnel.

(2) Qualifications for Safety and Health Person(s).

(a) Safety and Health Person(s) shall have a degree in engineering or safety in at least a four year program from an accredited school and shall have been engaged in safety and occupational health for at least one (1) year of experience (no time being credited to this one (1) year unless at least fifty (50) percent of the time was devoted to safety and occupational health) and shall have at least one (1) year experience in construction, or--

(b) Safety and Health Person(s) shall have legal registration as a Professional Engineer or a Certified Safety Professional and shall have been engaged in safety and occupational health for at least one (1) year of experience (no time being credited to this one (1) year unless at least fifty (50) percent of the time was devoted to safety and occupational health) and shall have at least one (1) year experience in construction, or--

(c) Safety and Health Person(s) shall have a degree other than that specified in paragraph, Qualifications for Safety and Health Person(s) above, and shall have been engaged in safety and occupational health for at least three (3) years of experience (no time being credited to these three (3) years unless at least fifty (50) percent of the time each year was devoted to safety and occupational health) and shall have at least two (2) years experience in construction, or--

(d) In lieu of a degree, Safety and Health person(s) shall have been engaged in safety and occupational health for at least five (5) years of experience (no time being credited to these five (5) years unless at least fifty (50) percent of the time each year was devoted to safety and occupational health) and shall have at least two (2) years experience in construction.

(e) First aid work is not a creditable experience.

(3) The name and qualifications of the nominated safety and health person(s) shall be furnished to the Contracting Officer for acceptability and a functional description of duties shall be provided prior to the pre-work conference.

NOTE: The Contractor shall have one or more Safety and Health Persons, each of whom meets the qualifications of (B)(2) Qualifications for Safety and Health Person(s), physically present on the actual site of the work whenever work of any sort is being performed by a Contractor, subcontractor, or supplier personnel on the work site. The foregoing clause language shall not be interpreted to contravene this note.

1.24 YEAR 2000 COMPLIANCE

The equipment for micro-processor controlled equipment and software, such as intrusion detection systems, utility monitoring and control systems, elevator controls, HVAC controls, computers, etc., that perform any type of date/time processing, shall be Year 2000 compliant and shall be able to accurately process date/time data (including, but not limited to, calculating, comparing, and sequencing) from, into, and between the twentieth and twenty-first centuries, including leap year calculations, when used in accordance with the product documentation provided by the Contractor, provided that all products (e.g. hardware, software, firmware) used in combination with other information technology shall accurately process date/time data if the other information technology properly exchanges date/time data with it.

1.25 CONTRACTOR BASE IDENTIFICATION CREDENTIALS

(A) The procedure for obtaining base identification passes for contractor personnel to work on any Air Force Material Command (AFMC) base shall be as follows:

(1) The contractor shall submit a written request on company letterhead stationary, if available, to the Contracting Officer specifying:

- a. Contract number.
- b. Location of work site:
- c. Date entry to the base must begin and contemplated termination date of entry.
- d. Names of contractor and subcontractor employee requiring access to the base.
- e. The name of the individual who will submit the Request of Identification Credentials for each employee for whom identification credentials are needed.

(2) Contracting Officer will:

- a. Endorse the request.
- b. Attach a copy of the contract cover page and any other pages that provide performance information, such as the need for and duration of access to the work site.
- c. Forward this request to the Security Police, Pass and Identification Office of the installation where the work is to be performed.
- d. Provide blank AFMC Form 496 and AF Form 2586 to the contractor.

(3) The contractor will be required to complete and submit AFMC Form 496, Request for Identification Credentials, for each of the firm's employees and for each subcontractor employee who must have access to the installation.

(4) The contractor shall also request AF Form 75, Visitor/Vehicle Pass or DD Form 2220, DoD Registered Vehicle, for vehicle decals when the Request for Identification Credentials is submitted. To obtain the vehicle decal from the Security Police, Pass and Identification Office, 75 SFS, Building 1219, south door, first office on the right, the contractor shall produce:

- a. A valid drivers license.
- b. Proof of financial responsibility or insurance which meets the minimum requirements of the contract clause entitled "Required Insurance."
- c. Current vehicle registration.
- d. All vehicles will comply with State of Utah inspection, emission standards, and insurance requirements prior to requesting vehicle decals.
- e. Any construction which may affect the base traffic flow pattern must be coordinated through 75 SFS/SFO, ext 7-5531.

(5) The Security Police, Pass and Identification Office, upon issuance of the appropriate badge for AF Form 2586, will provide a copy of the completed AF Form 2586 to the individual receiving the badge.

(6) Follow the guidance in AFR 125-37, The Resources Protection Program, when work under this contract requires unescorted entry to controlled areas. The contractor will request completion of an AF Form 2586, Unescorted Entry Authorization Certificate for each prime contract employee and subcontractor employee for which a controlled area badge is required. Contractor employees with controlled area badges are required to escort contractor employees without badges, at all times, in and out of controlled areas.

- a. In order to gain access to a controlled area the contractor must under go a local files check. This request is submitted through the contracting officer/engineer for the project, to 75 SFS/SFA1. If it becomes necessary to establish a free zone for the contractor it must be approved in writing by the installation commander. The free zone must have clear defined boundaries. It is recommended that the free zone begin at some point in the boundary of the controlled area which enables entry by the contractor and other authorized personnel the free zone must be closed during non-duty hours. The boundaries of the free zone must be under surveillance by the OPR for the area or designated responsible activity. See AFH 31-223 page 17 for further guidance.

(7) When contract performance requires unescorted entry (no access to classified information) to a "Restricted Area" on a military installation, contractor personnel requiring unescorted entry must meet the investigative requirements of AFR 205-32, USAF Personnel Security Program. Contractor employees not meeting these requirements will be provided escort as determined by the Contracting Officer in coordination with the Chief, Security Police Division of the military installation involved.

(8) If during any contract course of work it becomes necessary for the contractor to enter any unmanned base entry gate, they must first contact 75 SFS/SFO at ext 7-5531. If the contractor assumes custody or control of a particular gate, they will insure:

- a) Only cleared contractor personnel for that respective project gain access to the base through that gate.
- b) Lock and key control will be established in such a manner as to clearly define an audit trail of who have keys to the gates and the times the gates are opened and closed, 24 hours a day.

(B) Contractor employees, at all times while on a military installation, shall wear visible contractor-provided identification either as a

part of, or attached to, their outer clothing. The identification shall clearly identify the individual as being a contractor employee.

(C) During performance of the contract, the contractor shall be responsible for obtaining required identification for newly assigned personnel, and for prompt return of credentials and vehicle registration decals to the Security Police, Pass and Identification Office, for any employee who no longer requires access to the work site.

(D) At the termination or completion of the contract, or upon the expiration of credentials (if any such expirations are specified), the contractor must be sure that all base identification credentials and vehicle registration decals for all contractor and subcontractor employees are returned to the Security Police, Pass and Identification Office.

(E) Prior to submitting an invoice for final payment, the prime contractor shall obtain a clearance certification from the issuing Pass and Identification Office which states that all base identification credentials and vehicle decals have been returned or "accounted for." This certification shall be attached to the final invoice at the time of submittal for payment. Failure to comply with these requirements will result in withholding final payment until compliance is effected.

1.26 COLD WEATHER PRECAUTIONS

(A) Contractor shall be responsible for proper application of weather sensitive materials and shall not apply any such materials when weather conditions fall below the minimums recommended by the material manufacturer.

(B) Contractor shall cover all concrete installed in weather below 32 0F (0 0C) with approved insulating blankets.

(C) Contractor is responsible in weather below 40 0F (4 0C) that water lines, including fire protection systems, do not freeze.

(D) Contractor shall maintain unoccupied interior portions of building under construction above 50 0F (10 0C). Contractor shall maintain occupied portions of the building under construction above 65 0F (18 0C). This requirement shall replay also in the event that available heating supplied by the building system is rendered inadequate by the contractor during the course of construction to maintain the above temperature.

(E) The only type of temporary heating devices permitted are UL approved electric heaters. The contractor shall physically monitor all temporary heating devices at least every four hours. Exception to this requires written approval from the Base Fire Department.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

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SECTION 02050

DEMOLITION

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ENGINEERING MANUALS (EM)

EM 385-1-1 (1992) U.S. Army Corps of Engineers Safety and Health Requirements Manual

1.2 GENERAL REQUIREMENTS

The work includes demolition and removal of resulting rubbish and debris. Rubbish and debris shall be removed from Government property daily, unless otherwise directed, to avoid accumulation at the demolition site. Materials that cannot be removed daily shall be stored in areas specified by the Contracting Officer. In the interest of occupational safety and health, the work shall be performed in accordance with EM 385-1-1, Section 23, Demolition, and other applicable Sections.

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300SUBMITTAL PROCEDURES:

SD-08 Statements

Work Plan; FIO.

The procedures proposed for the accomplishment of the work. The procedures shall provide for safe conduct of the work, including procedures and methods to provide necessary supports, lateral bracing and shoring when required, careful removal and disposition of materials specified to be salvaged, protection of property which is to remain undisturbed, coordination with other work in progress, and timely disconnection of utility services. The procedures shall include a detailed description of the methods and equipment to be used for each operation, and the sequence of operations in accordance with EM 385-1-1.

1.4 DUST CONTROL

The amount of dust resulting from demolition shall be controlled to prevent the spread of dust to occupied portions of the construction site and to avoid creation of a nuisance in the surrounding area. Use of water will not be permitted when it will result in, or create, hazardous or objectionable conditions such as ice, flooding and pollution.

1.5 PROTECTION

1.5.1 Protection of Personnel

During the demolition work the Contractor shall continuously evaluate the condition of the structure being demolished and take immediate action to protect all personnel working in and around the demolition site. No area, section, or component of floors, roofs, walls, columns, pilasters, or other structural element will be allowed to be left standing without sufficient bracing, shoring, or lateral support to prevent collapse or failure while workmen remove debris or perform other work in the immediate area.

Floors, roofs, walls, columns, pilasters, and other structural components that are designed and constructed to stand without lateral support or shoring, and are determined to be in stable condition, may be allowed to remain standing without additional bracing, shoring, or lateral support until demolished. The Contractor shall ensure that no elements determined to be unstable are left unsupported and shall be responsible for placing and securing bracing, shoring, or lateral supports as may be required as a result of any cutting, removal, or demolition work performed under this contract.

1.5.2 Protection of Existing Property

Before beginning any demolition work, the Contractor shall survey the site and examine the drawings and specifications to determine the extent of the work. The Contractor shall take necessary precautions to avoid damage to existing items to remain in place; any damaged items shall be repaired or replaced as approved by the Contracting Officer. The Contractor shall coordinate the work of this section with all other work and shall construct and maintain shoring, bracing, and supports as required. The Contractor shall ensure that structural elements are not overloaded and shall be responsible for increasing structural supports or adding new supports as may be required as a result of any cutting, removal, or demolition work performed under this contract.

1.5.3 Protection of Trees

Trees within the project site which might be damaged during demolition and which are indicated to be left in place shall be protected by a 1.83 m (6 foot) high fence. The fence shall be securely erected a minimum of 1.5 m from the trunk of individual trees or follow the outer perimeter of branches or clumps of trees. Any tree designated to remain that is damaged during the work under this contract shall be replaced in kind or as approved by the Contracting Officer.

1.6 BURNING

The use of burning at the project site for the disposal of refuse and debris will not be permitted.

1.7 USE OF EXPLOSIVES

Use of explosives will not be permitted.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 EXISTING STRUCTURES

Existing structures indicated shall be removed to full depth of structure.

3.2 UTILITIES

Existing utilities shall be removed as indicated. When utility lines are encountered that are not indicated on the drawings, the Contracting Officer shall be notified prior to further work in that area.

3.3 FILLING

Holes, open basements and other hazardous openings shall be filled.

3.4 DISPOSITION OF MATERIAL

Title to material and equipment to be demolished is vested in the Contractor upon receipt of notice to proceed. The Government will not be responsible for the condition, loss or damage to such property after notice to proceed.

3.4.1 Salvageable Items and Material

Contractor shall salvage items and material to the maximum extent possible.

3.4.1.2 Items Salvaged for the Government

Salvaged items to remain the property of the Government shall be removed in a manner to prevent damage. Items damaged during removal or storage shall be repaired or replaced to match existing items. The following items reserved as property of the Government shall be delivered to the areas designated: Rails from building 1459.

3.4.2 Unsalvageable Material

Concrete, masonry, and other noncombustible material shall be disposed of off the site.

3.5 CLEAN UP

Debris and rubbish shall be removed from basement and similar excavations. Debris shall be removed and transported in a manner that prevents spillage on streets or adjacent areas. Local regulations regarding hauling and disposal shall apply.

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SECTION 02210

GRADING

PART 1 GENERAL

1.1 SCOPE OF WORK

This Section specifies rough grading and compaction for the site and facility pad(s) along with the final grading and finishing for paved areas and open areas. All final earthwork, grading, and earth covering for the facilities is specified in Section 02221 EXCAVATION, FILLING AND BACKFILLING FOR BUILDINGS. All utility earthwork is specified under Section 02222 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 422	(1963; R 1990) Particle-Size Analysis of Soils
ASTM D 1556	(1990) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1557	(1991) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu.m.))
ASTM D 2216	(1992) Laboratory Determination of Water (Moisture) Content of Soil and Rock
ASTM D 2487	(1992;R 1993) Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 2922	(1991) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 3017	(1988) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
ASTM D 3740	(1992) Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
ASTM D 4318	(1984) Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D 5268	(1992)Topsoil Used for Landscaping Purposes

1.3 DEFINITIONS

1.3.1 Satisfactory Materials

Materials, including imported borrow materials, classified in ASTM D 2487 as GW, GP, GM, GC, SW, SP, SM, SC, CL and combinations of these such as SP-SM are satisfactory for use on this project. Materials shall be free from roots and other organic matter, trash, debris, and frozen materials and stones larger than 50 mm. Additionally, the percent passing the No. 40 standard sieve shall have a liquid limit of no greater than 35 when tested in accordance with ASTM D 4318.

1.3.2 Unsatisfactory Materials

Materials which do not comply with the requirements for satisfactory materials are unsatisfactory. Specifically, materials classified in ASTM D 2487 as CH, MH, Pt, OH, and OL are unsatisfactory. Man-made fills and backfills of otherwise satisfactory materials from previous construction are unsatisfactory until compacted to the densities specified herein. Any materials that will not readily compact to the densities specified herein are unstable and unsatisfactory.

1.3.2.1 Unstable Materials

Materials that cannot be properly compacted or will not support construction equipment due to excessive moisture are unstable. Potentially unstable materials are fine grained soils with moisture contents near or above the plastic limit or 5 or more percent above the ASTM D 1557 optimum water content. Unstable materials are also indicated by waving, rutting, and shoving under the wheels and rollers of construction equipment. Unstable material may be encountered at this site during construction. Unstable material will require disk and drying and/or replacement and disposal. Bridging of unstable areas may be performed with the authorization of the Contracting Officer. No additional compensation shall be forthcoming for the extra construction effort, time loss, or any other costs of remediation for unstable conditions.

1.3.3 Degree of Compaction

Degree of compaction is a percentage of the maximum density obtained by the test procedure presented in ASTM D 1557, Procedure C, abbreviated below as a percent of laboratory maximum dry density.

1.3.4 Topsoil

Materials obtained from offsite areas and surface excavations, suitable for planting, and meeting the requirements of ASTM D 5268 are defined as topsoil.

1.4 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL DESCRIPTIONS:

SD-08 Statements

Field Testing Control; FIO.

Qualifications of the commercial testing laboratory who will be performing all testing in accordance with paragraph FIELD TESTING CONTROL.

SD-09 Reports

Field Testing Control; FIO. Satisfactory Materials; FIO.

Certified test reports and analysis certifying that the satisfactory materials proposed for use at the project site conform to the specified requirements, and for all tests conducted in accordance with paragraph FIELD TESTING CONTROL.

1.5 SUBSURFACE DATA

Subsurface soil boring logs are shown on the drawings. These data represent the best subsurface information available; however, variations may exist in the subsurface between boring locations.

PART 2 PRODUCTS

2.1 BORROW MATERIAL

Borrow material shall be satisfactory and selected to meet requirements and conditions of the particular fill for which it is to be used. Necessary clearing, grubbing, disposal of debris, and satisfactory drainage of borrow pits shall be performed by the Contractor as incidental operations to the borrow excavation. Borrow materials shall be tested in conformance with ASTM D 2487 and shall meet the following general requirements:

Sieve Size	Percent Passing by Weight
2-inch	100
No. 4	30-90
No. 200	0-35

Liquid Limit of less than 35
Plasticity Index of less than 12

2.1.1 Selection

Borrow materials shall be obtained from sources outside the limits of Government-controlled land and shall be subject to approval. Borrow materials shall be subject to approval. The source of borrow material shall be the Contractor's responsibility. Unless otherwise provided in the contract, the Contractor shall obtain from the owners the right to procure material, shall pay all royalties and other charges involved, and shall bear all the expense of developing the sources, including rights-of-way for hauling.

2.1.2 Borrow Pits

Except as otherwise permitted, borrow pits shall be excavated to afford adequate drainage. Overburden and other spoil material shall be disposed of or used for special purposes. Borrow pits shall be neatly trimmed after the excavation is completed.

PART 3 EXECUTION

3.1 CONSERVATION OF TOPSOIL

Topsoil shall be removed to a depth of 150 mm without contamination with subsoil and stockpiled convenient to areas for later application or at locations shown on the landscape drawings. Topsoil shall be stored separate from other excavated materials and piled free of roots, rock particles in excess of 25 mm, and other undesirable materials. Any surplus of topsoil from excavations and grading shall be removed from the site.

3.2 EXCAVATION

After topsoil removal has been completed, excavation of every description, regardless of material encountered, within the grading limits of the project shall be performed to the lines and grades indicated. Satisfactory excavated material shall be transported to and placed in fill areas within the limits of the work. All unsatisfactory material including any soil which is softened due to exposure to the elements and water and surplus material shall be removed from site. All unsatisfactory materials shall be removed from Government-controlled land, at the Contractor's expense, prior to the completion of construction. All excess satisfactory material shall be removed from Government-controlled land, at the Contractor's expense, prior to the completion of construction, unless otherwise directed by the Contracting Officer. In the event that it is necessary to remove unsatisfactory material to a depth greater than specified, the Contracting Officer shall be notified. No additional compensation shall be forthcoming for the excavation and replacement of materials rendered unsatisfactory by Contractor managed operations. A change in the Contract price shall be considered for incidents where (in the interpretation of the Contracting Officer) where unsatisfactory materials are encountered at depths and/or locations that are substantially different from those shown on the Contract Exploration Logs. Excavations carried below the depths indicated, without specific directions, shall be refilled to the proper grade with properly compacted satisfactory material at the Contractor's expense. Excavation and filling shall be performed in a manner and sequence that will provide drainage at all times. Excavations shall be kept free from water while construction therein is in progress. Material required for fills in excess of that produced by excavation within the grading limits shall be obtained from approved borrow areas.

3.3 DITCHES, GUTTERS, AND CHANNEL CHANGES

Ditches, gutters, and channel changes shall be cut accurately to the cross sections and grades indicated. All rock and foreign matter in the sides and bottom of ditches, gutters, and channel changes shall be trimmed and dressed or removed to conform to the slope, grade, and shape of the section indicated. Care shall be taken not to excavate ditches and gutters below the grades indicated. Excessive ditch and gutter excavation shall be backfilled to grade either with satisfactory, thoroughly compacted material or with suitable stone or cobble facing to form an adequate gutter paving as directed. All ditches and gutters excavated under this section shall be maintained until final acceptance of the work. Satisfactory material excavated from ditches and channel changes may be placed in fill areas. Unsatisfactory and excess excavated material shall be disposed of in accordance with directions in paragraph EXCAVATION. No excavated material shall be deposited closer to the edges of the ditches than indicated and in no case less than 1 meter.

3.4 BACKFILL ADJACENT TO STRUCTURES

Backfill adjacent to structures shall be placed and compacted uniformly in such manner as to prevent wedging action or eccentric loading upon or against the structures. Slopes bounding or within areas to be backfilled shall be stepped or serrated to prevent sliding of the fill. During backfilling operations and in the formation of embankments, equipment that will overload the structure in passing over and compacting these fills shall not be used. Backfill for storm drains and subdrains, including the bedding and backfill for structures other than culverts and drains, shall conform to the additional requirements in other applicable sections.

3.5 PREPARATION OF GROUND SURFACE FOR FILL

All vegetation, such as roots, brush, sods, grass, and all decayed vegetable matter, rubbish, and other unsatisfactory material within the area upon which fill is to be placed, shall be stripped or otherwise removed before the fill is started. In no case will unsatisfactory material remain in the upper 150 mm of the subgrade of the fill area. Sloped ground surfaces steeper than one vertical to four horizontal on which fill is to be placed shall be plowed, stepped, or broken up, as directed, in such manner that the fill material will bond with the existing surface. Prepared surfaces on which compacted fill is to be placed shall be wetted or dried as may be required to obtain the specified moisture content and density.

3.6 FILLS AND EMBANKMENTS

Fills and embankments shall be constructed of satisfactory material at the locations and to lines and grades indicated. The completed fill shall conform to the shape of the typical sections indicated or shall meet the requirements of the particular case. The material shall be placed in successive horizontal layers of 200 mm in loose depth for the full width of the cross section and shall be compacted as specified. Each layer shall be compacted and tested before the overlaying lift is placed. Moisture content of the fill or backfill material shall be adjusted by wetting or aerating, as required, to within plus or minus 2 percent of optimum moisture content as determined from laboratory tests specified in paragraph DEFINITIONS.

3.7 COMPACTION

Each layer of the fill or embankment for open areas shall be compacted to at least 90 percent of laboratory maximum dry density. Building pads and areas to be paved shall be compacted to at least 95 percent of the laboratory maximum dry density, within 2 percent of the optimum water content, full depth.

3.8 FINISHED EXCAVATION, FILLS, AND EMBANKMENTS

All areas covered by the project, including excavated and filled sections and adjacent transition areas, shall be uniformly smooth-graded. The finished surface shall be smooth, compacted, and free from irregular surface changes. The degree of finish shall be that ordinarily obtainable from blade-grader operations, except as otherwise specified. Ditches and gutters shall be finished to permit adequate drainage. The surface of areas to be planted shall be finished to a smoothness suitable for planting. For subgrade areas to be paved, the following shall be

accomplished as required: (a) soft or otherwise unsatisfactory material shall be replaced with satisfactory excavated material or other approved materials; (b) rock and concrete encountered in the cut sections shall be excavated to a depth of 150 mm below the finished subgrade elevation; (c) low areas resulting from removal of unsatisfactory material or from excavation of rock shall be brought up to required grade with satisfactory materials, and the entire subgrade shall be shaped to line, grade, and cross section and shall be compacted as specified. The surface of building pads and paved areas on which a base course is to be placed shall vary not more than 15 mm from the established grade and approved cross section. Other surfaces shall be finished not more than 30 mm above or below the established grade or approved cross section.

3.9 PLACING TOPSOIL

On areas to receive topsoil, the compacted subgrade soil shall be scarified to a 50 mm depth for bonding of topsoil with subsoil. Topsoil then shall be spread evenly to a thickness of 75 mm and graded to the elevations and slopes shown. Topsoil shall not be spread when frozen or excessively wet or dry. Material required for topsoil in excess of that produced by excavation within the grading limits shall be obtained from areas off of Government-controlled land.

3.10 FIELD TESTING CONTROL

Testing shall be the responsibility of the Contractor and shall be performed by an approved commercial testing laboratory subject to approval and meeting the requirements specified in ASTM D 3740. Sampling and testing shall be performed according to the Construction Control Manual CESPK PAM 415-1-2.

3.10.1 Field Density with Moisture Content

Field in-place density shall be determined in accordance with ASTM D 1556 or ASTM D 2922. When ASTM D 2922 is used, the calibration curves shall be checked, and adjusted if necessary, using the sand cone method as described in paragraph Calibration of the ASTM publication. When ASTM D 2922 is used, the Contractor shall obtain all required clearances and permits for the use of nuclear test methods. ASTM D 2922 results in a wet unit weight of soil and when using this method, ASTM D 3017 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall be checked along with density calibration checks as described in ASTM D 3017. The calibration checks, using ASTM D 1556 and ASTM D 2216, for both the density and moisture gauges shall be made at the beginning of a job and on each different type of material encountered; a minimum one calibration check shall be performed for each set of five nuclear compaction tests.

3.10.2 Moisture-Density Relationships

Moisture-density relationships shall be determined by the test method outlined in ASTM D 1557.

3.10.3 Gradations, Atterberg Limits, and Classification

Gradation testing for soil materials shall be performed in accordance with ASTM D 422. Atterberg limits shall be determined by ASTM D 4318.

Classification shall be determined by the test methods outlined ASTM D 2487.

3.10.4 Testing Schedule

Testing shall be as follows:

(a) Field Density with Moisture Content: For area fills, perform two tests per each increment or fraction of 1000 square meters placed during each 8 hour shift.

(b) Gradation with Atterberg Limits: From compacted material; one test for every 5 field density tests.

(c) Moisture-Density Relationship with Gradations, Atterberg Limits, and Classification: From a bulk sample; one set of tests for every 5 field density tests (with not less than one test for each type of material) for the first 25 field density tests. Thereafter, one additional test for each change in material.

3.11 PROTECTION

Newly graded areas shall be protected from traffic and from erosion, and any settlement or washing away that may occur from any cause, prior to acceptance, shall be repaired and grades reestablished to the required elevations and slopes. All work shall be conducted in accordance with the environmental protection requirements of the contract.

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SECTION 02221

EXCAVATION, FILLING AND BACKFILLING FOR BUILDINGS

PART 1 GENERAL

1.1 SCOPE OF WORK

This section specifies final earthwork for facility foundations, slabs-on-grade, and earth cover except the underground utility earthwork, which is specified in Section 02222 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN CONCRETE INSTITUTE

ACI 229R (1994) Controlled Low Strength Materials

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 33	(1993) Concrete Aggregates
ASTM C 39	(1986) Compressive Strength of Cylindrical Concrete Specimens
ASTM C 131	(1989) Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C 136	(1993) Sieve Analysis of Fine and Coarse Aggregates
ASTM D 422	(1963; R 1990) Particle-Size Analysis of Soils
ASTM D 1556	(1990) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1557	(1991) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu. m.))
ASTM D 2216	(1992) Laboratory Determination of Water (Moisture) Content of Soil and Rock
ASTM D 2487	(1992;R 1993) Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 2922	(1991) Density of Soil and Soil-Aggregate

	in Place by Nuclear Methods (Shallow Depth)
ASTM D 3017	(1988) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
ASTM D 3740	(1992) Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
ASTM D 4318	(1984) Liquid Limit, Plastic Limit, and Plasticity Index of Soils

1.3 DEFINITIONS

1.3.1 Degree of Compaction

Degree of compaction required is expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 1557 Procedure C, abbreviated hereinafter as percent laboratory maximum dry density.

1.4 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL DESCRIPTIONS:

SD-09 Reports

Field Density Tests; FIO. Testing of Backfill Materials; FIO.

Copies of all laboratory and field test reports within 24 hours of the completion of the test.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Satisfactory Materials

Materials classified in ASTM D 2487 as GW, GP, GM, GC, SW, SP, SM, SC, CL and combinations of these such as SP-SM are satisfactory for use on this project. Materials shall be free from roots and other organic matter, trash, debris, and frozen materials and stones larger than 50 mm. The portion passing the No. 40 standard sieve shall have a liquid limit of no greater than 35 when tested in accordance with ASTM D 4318.

2.1.2 Unsatisfactory Materials

Materials which do not comply with the requirements for satisfactory materials are unsatisfactory. Materials classified in ASTM D 2487 as CH, MH, Pt, OH, and OL are unsatisfactory. Man-made fills and backfills of otherwise satisfactory materials from previous construction are unsatisfactory until compacted to the densities specified herein. Any materials that will not readily compact to the densities specified herein are unstable and unsatisfactory.

2.1.2.1 Unstable Materials

Materials that cannot be properly compacted or will not support construction equipment due to excessive moisture are unstable. Potentially unstable materials are fine grained soils with moisture contents near or above the plastic limit or 5 or more percent above the ASTM D 1557 optimum water content. Unstable materials are also indicated by waving, rutting, and shoving under the wheels and rollers of construction equipment. Unstable material may be encountered at this site during construction. Unstable material will require disk and drying and/or replacement and disposal. No additional compensation shall be forthcoming for the extra construction effort, time loss, or any other costs of remediation for unstable conditions.

2.2 CAPILLARY WATER BARRIER MATERIAL

Capillary water barrier material shall consist of clean, crushed, nonporous rock, crushed gravel, or uncrushed gravel. Capillary water barrier material shall be graded to meet the requirements for size 57 or 67 concrete coarse aggregate as specified in ASTM C 33.

2.3 SAND

Sand shall conform to ASTM C 33 requirements for concrete fine aggregate. Additionally, sand shall have water content of less than 7 percent as determined by ASTM D 2216.

2.4 CONTROLLED LOW STRENGTH MATERIAL

Controlled low strength material (CLSM) shall meet the requirements specified in ACI 229R and shall consist of a lean concrete slurry of type II portland cement blended with size 7 concrete coarse rounded aggregate conforming to the requirements specified in ASTM C 33. Controlled low strength material shall have a 28-day compressive strength of between 345 and 690 kpa when tested in accordance with ASTM C 39.

PART 3 EXECUTION

3.1 CLEARING AND GRUBBING

The areas within lines 1.5 m outside of each building and structure line shall be cleared of roots, brush and other vegetation, debris, existing foundations, pavements, utility lines, structures, fences, and other items that would interfere with construction operations. Foundations, roots, and utility lines shall be completely removed and the resulting depressions shall be filled with satisfactory material, placed and compacted in accordance with paragraph FILLING AND BACKFILLING. Unsatisfactory materials removed shall be disposed of outside the limits of Government-controlled property at the Contractor's responsibility.

3.2 TOPSOIL

Topsoil shall be stripped to a depth of 150 mm below the existing grade within the designated excavations and grading lines and deposited in storage piles for later use. Excess topsoil shall be disposed as specified in Section 02210 GRADING.

3.3 EXCAVATION

Excavation shall conform to the dimensions and elevations indicated for each building, structure, and footing and shall include trenching for utility and foundation drainage systems to a point 2 meters beyond the building line of each facility. Additionally, excavation shall include excavation for outside underground fuel tanks, and all work incidental thereto. Trenching for utilities is specified in Section 02222 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS. Excavation shall extend a sufficient distance from walls and footings to allow for placing and removal of forms. Excavations below indicated depths will not be permitted except to remove unsatisfactory material. Unsatisfactory material encountered below the grades shown shall be removed as directed and replaced with properly compacted satisfactory material. No additional compensation shall be forthcoming for the excavation and replacement of materials rendered unsatisfactory by Contractor managed operations. A change in the Contract price shall be considered for incidents where (in the interpretation of the Contracting Officer) unsatisfactory materials are encountered at depths and/or locations that are substantially different from those shown on the Contract Exploration Logs. Determination of elevations and measurements of approved overdepth excavation of unsatisfactory material below grades indicated shall be done under the direction of the Contracting Officer. Satisfactory material removed below the depths indicated without specific direction of the Contracting Officer shall be replaced at no additional cost to the Government to the indicated excavation grade with satisfactory materials. Satisfactory material shall be placed and compacted as specified in paragraph FILLING AND BACKFILLING.

3.4 DRAINAGE AND DEWATERING

3.4.1 Drainage

Surface water shall be directed away from excavation and construction sites so as to prevent erosion and undermining of foundations. Diversion ditches, dikes and grading shall be provided and maintained as necessary during construction. Excavated slopes and backfill surfaces shall be protected to prevent erosion and sloughing. Excavation shall be performed so that the site and the area immediately surrounding the site and affecting operations at the site shall be continually and effectively drained. No additional compensation shall be forthcoming for the removal and replacement of materials rendered unsatisfactory because of the Contractor's failure to adequately drain the site.

3.4.2 Dewatering

Groundwater and water from broken utility lines that flows toward or into excavations shall be controlled to prevent sloughing of excavation slopes and walls, boils, uplift and heave in the excavation and to eliminate interference with orderly progress of construction. French drains, sumps, ditches or trenches will not be permitted within 15 meters of the foundation of any structure, except with specific written approval, and after specific contractual provisions for restoration of the foundation area have been made. No additional compensation shall be forthcoming for the removal and replacement of materials rendered unsatisfactory because of the Contractor's failure to adequately dewater excavations.

3.5 SHORING

Shoring, including sheet piling, shall be furnished and installed as necessary to protect workmen, banks, adjacent paving, structures, and

utilities. Shoring, bracing, and sheeting shall be removed as excavations are backfilled, in a manner to prevent caving. No additional compensation shall be forthcoming for shoring.

3.6 CLASSIFICATION OF EXCAVATION

Excavation will be unclassified regardless of the nature of material encountered. No additional compensation shall be forthcoming for the removal of rock or cemented soil materials.

3.7 BLASTING

Blasting will not be permitted.

3.8 UTILITY AND DRAIN TRENCHES

Trenches for underground utilities systems and drain lines shall be excavated as specified in Section 02222 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS. Trenches shall be excavated to the required alignment, depth, and slope.

3.9 BORROW

Where satisfactory materials are not available in sufficient quantity from required excavations, approved materials shall be obtained Section 02210 GRADING.

3.10 EXCAVATED MATERIALS

Satisfactory excavated material required for fill or backfill shall be placed in the proper section of the permanent work required under this section or shall be separately stockpiled if it cannot be readily placed. Satisfactory material in excess of that required for the permanent work and all unsatisfactory material shall be disposed of as specified in Section 02210 GRADING.

3.11 FINAL GRADE OF SURFACES TO SUPPORT CONCRETE

All foundation excavations shall be inspected and approved by the Contracting Officer prior to the placement of reinforcing steel and again immediately prior to the placement of foundation concrete. No steel or concrete shall be placed in excavations that contain unstable material, standing water, debris, or loose material. If finished excavations are to be left in an open condition for over 48 hours prior to concrete placement, their bottoms should be protected and leveled with a 100 mm layer of controlled low strength material.

3.12 SUBGRADE PREPARATION

Unsatisfactory material in surfaces to receive fill or in excavated areas shall be removed and replaced with satisfactory materials. The surface shall be scarified to a depth of 150 mm before the fill is started. Sloped surfaces steeper than 1 vertical to 4 horizontal shall be plowed, stepped, benched, or broken up so that the fill material will bond with the existing material. When subgrades are less than the specified density, the ground surface shall be broken up to a minimum depth of 150 mm, pulverized, and compacted to the specified density. When the subgrade is part fill and part cut or ungraded natural ground, the cut or ungraded natural ground portion shall be scarified to a depth of 300 mm and compacted as specified

for the adjacent fill. Material shall not be placed on surfaces that are muddy, frozen, or contain frost. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, or other approved equipment well suited to the soil being compacted. Material shall be moistened or aerated as necessary to plus or minus 2 percent of the optimum moisture content. Minimum subgrade density shall be as specified in paragraph FILLING AND BACKFILLING.

3.13 FILLING AND BACKFILLING

Satisfactory materials shall be used in bringing fills and backfills to the lines and grades indicated and for replacing unsatisfactory materials. Satisfactory materials shall be placed in horizontal layers not exceeding 200 mm in loose thickness, or 150 mm when hand-operated compactors are used. After placing, each layer shall be plowed, disked, or otherwise broken up, moistened or aerated as necessary, thoroughly mixed and compacted as specified. Backfilling shall not begin until construction below finish grade has been approved, underground utilities systems have been inspected, tested and approved, forms removed, and the excavation cleared of trash and debris. Backfill shall be brought to indicated finish grade and shall include backfill for exterior underground fuel tanks. Backfill shall not be placed in wet or frozen areas. Heavy equipment for spreading and compacting backfill shall not be operated closer to foundation or retaining walls than a distance equal to the height of backfill above the top of footing; the area remaining shall be compacted in layers not more than 100 mm in compacted thickness with power-driven hand tampers suitable for the material being compacted. Backfill shall be placed carefully around pipes or tanks to avoid damage to coatings, wrappings, or tanks. Backfill shall not be placed against foundation walls prior to 7 days after completion of the walls. As far as practicable, backfill shall be brought up evenly on each side of the wall and sloped to drain away from the wall. Each layer of fill and backfill shall be compacted to not less than the percentage of maximum dry density specified below, within 2 percent of the optimum water content:

	Percent Laboratory maximum dry density
<hr/>	
Fill, embankment, and backfill	
<hr/>	
Under structures, building slabs, steps, aprons, around footings, and in trenches, full depth	95
Open areas and cover soils	90
<hr/>	
Subgrade	
<hr/>	
Under building slabs and steps, upper 300 mm minimum or full depth of fill	95
Under aprons and sidewalks, upper 150 mm or full depth of fill	95

Approved compacted subgrades that are disturbed by the Contractor's operations or adverse weather shall be scarified and compacted as specified herein before to the required density prior to further construction thereon. No additional compensation shall be forthcoming for subgrade correction measures. Recomaction over underground utilities and heating lines shall be by hand tamping only.

3.14 TESTING

Testing shall be the responsibility of the Contractor and shall be performed at no additional cost to the Government. Testing shall be performed by an approved commercial testing laboratory subject to approval and meeting the requirements specified in ASTM D 3740. Sampling and testing shall be performed according to the Construction Control Manual CESPK PAM 415-1-2.

3.14.1 In-Place Densities

Field in-place density shall be determined in accordance with ASTM D 1556 or ASTM D 2922. When ASTM D 2922 is used, the calibration curves shall be checked and adjusted if necessary by the procedure described in ASTM D 2922, paragraph ADJUSTING CALIBRATION CURVE. ASTM D 2922 results in a wet unit weight of soil and when using this method ASTM D 3017 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall also be checked along with density calibration checks as described in ASTM D 3017. Calibration checks, using ASTM D 1556 and ASTM D 2216, for both the density and moisture gauges shall be made at the beginning of a job and on each different type of material encountered; a minimum one calibration check shall be performed for each set of five nuclear compaction tests.

3.14.2 Moisture-Density Relationship

Moisture-density relationships shall be determined by the test method outlined in ASTM D 1557.

3.14.3 Gradation, Atterberg Limits, and Classification

Gradation testing of aggregates shall be performed by the test method outlined in ASTM C 136. Gradation testing for soil materials shall be performed in accordance with ASTM D 422. Atterberg limits shall be determined by ASTM D 4318. Classification shall be determined by the test method outlined in ASTM D 2487.

3.14.4 Miscellaneous Testing

Wear tests for capillary water barrier material and controlled low-strength material aggregate shall be performed in accordance with ASTM C 131. Aggregates shall have a loss of no greater than 40 percent when tested with 500 revolutions. A minimum of two compressive strength tests shall be in accordance with ASTM C 39 for each source of controlled low strength material. Sieve size analysis for capillary water barrier material, sand, and controlled low-strength material aggregate shall be performed in accordance with ASTM C 136.

3.14.5 Testing Schedule

The following number of tests, if performed at the appropriate time, shall

be the minimum acceptable for each type operation.

(a) Field Density and Moisture Content: For wall footings and utility trenches, perform one test for each lift or each increment or fraction of 60 meters. For isolated column footings, one random test during backfilling operations at each footing location.

(b) Moisture-Density Relationship with Gradation, Atterberg Limits, and Classification: From a bulk sample; one set of tests for every 5 field density tests (with not less than 1 test for each type of material) for the first 25 field density tests. Thereafter, one additional test for each change in material.

(c) Miscellaneous Granular Materials: For capillary water barrier material and controlled low-strength material aggregate; perform a minimum of two random sieve size analyses and two wear tests for each material source. Perform a minimum of two sieve size analyses and two water content tests for in-place sand as the vapor barrier cushion. A minimum of two compressive strength tests shall be performed for each source of controlled low strength material.

3.15 CAPILLARY WATER BARRIER CONSTRUCTION

The 150 mm capillary water barrier under interior slabs-on-grade shall be placed directly on the subgrade, one lift, and shall be compacted with a hand-operated plate-type vibratory compactor until no additional elevation changes occur in the surface of the material. The capillary water barrier shall be inspected and approved by the Contracting Officer prior to the placement of the vapor barrier or slab-on-grade.

3.16 VAPOR BARRIER CONSTRUCTION

Where indicated, a vapor barrier consisting of a 0.5 mm polyethylene sheet with a 100 mm sand cushion shall be placed directly under the building slab-on-grade and on top of the capillary water barrier. Adjacent edges of the polyethylene sheet shall be lapped by a minimum of 100 mm and sealed with pressure sensitive tape. All utility risers and other penetrations shall be completely wrapped and sealed with the polyethylene sheet and taped. The polyethylene sheet shall be inspected and approved by the Contracting Officer prior to the placement of the sand cushion. The sand cushion layer shall be kept in a smooth and dry condition during reinforcement steel placement and shall be inspected prior to slab-on-grade placement. The sand cushion layer shall be protected during concrete placement.

3.17 GRADING

Areas within 1.5 m outside of each building and structure line shall be constructed true-to-grade, shaped to drain, and shall be maintained free of trash and debris until final inspection has been completed and the work has been accepted.

3.18 SPREADING TOPSOIL

Areas outside the building lines from which topsoil has been removed shall be topsoiled. The surface shall be free of materials that would hinder planting or maintenance operations. The subgrade shall be pulverized to a depth of 50 mm by disking or plowing for the bonding of topsoil with the subsoil. Topsoil shall then be uniformly spread, graded, and compacted to

the thickness, elevations, slopes shown, and left free of surface irregularities. Topsoil shall be compacted by one pass of a cultipacker, roller, or other approved equipment weighing 1.46 kN/m to 2.34 kN/m of roller. Topsoil shall not be placed when the subgrade is frozen, excessively wet, extremely dry, or in a condition otherwise detrimental to seeding, planting, or proper grading.

3.19 PROTECTION

Settlement or washing that occurs in graded, topsoiled, or backfilled areas prior to acceptance of the work shall be repaired and grades reestablished to the required elevations and slopes.

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SECTION 02222

EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS

PART 1 GENERAL

1.1 SCOPE OF WORK

This section specifies all earthwork for underground utilities systems under open areas, buildings, and pavement sections.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN CONCRETE INSTITUTE

ACI 229R (1994) Controlled Low Strength Materials

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 33	(1993) Concrete Aggregates
ASTM C 39	(1986) Compressive Strength of Cylindrical Concrete Specimens
ASTM C 136	(1993) Sieve Analysis of Fine and Coarse Aggregates
ASTM D 422	(1963; R 1990) Particle-Size Analysis of Soils
ASTM D 1556	(1990) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1557	(1991) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu. m.))
ASTM D 2216	(1992) Laboratory Determination of Water (Moisture) Content of Soil, and Rock
ASTM D 2487	(1992;R 1993) Classification of Soils for Engineering Purposes (Unified Soil Classification System
ASTM D 2922	(1991) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 3017	(1988) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
ASTM D 3740	(1992) Minimum Requirements for Agencies

Engaged in the Testing and/or Inspection
of Soil and Rock as Used in Engineering
Design and Construction

1.3 DEFINITIONS

1.3.1 Degree of Compaction

Degree of compaction shall be expressed as a percentage of the maximum dry density obtained by the test procedure presented in ASTM D 1557 Procedure C.

1.4 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL DESCRIPTIONS:

SD-09 Reports

Field Density Tests; FIO. Testing of Backfill Materials; FIO.

Copies of all laboratory and field test reports within 24 hours of the completion of the test.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Satisfactory Materials

Materials classified in ASTM D 2487 as GW, GP, GM, GC, SW, SP, SM, SC, CL and combinations of these such as SP-SM are satisfactory for use on this project. Materials shall be free from roots and other organic matter, trash, debris, and frozen materials and stones larger than 50 mm. The portion passing the No. 40 standard sieve shall have a liquid limit of no greater than 35 when tested in accordance with ASTM D 4318.

2.1.2 Unsatisfactory Materials

Materials which do not comply with the requirements for satisfactory materials are unsatisfactory. Materials classified in ASTM D 2487 as CH, MH, Pt, OH, and OL are unsatisfactory. Man-made fills and backfills of otherwise satisfactory materials from previous construction are unsatisfactory until compacted to the densities specified herein. Any materials that will not readily compact to the densities specified herein are unstable and unsatisfactory.

2.1.2.1 Unstable Materials

Materials that cannot be properly compacted or will not support construction equipment or conduits and their appurtenances due to excessive moisture are unstable. Potentially unstable materials are fine grained soils with moisture contents near or above the plastic limit or 5 or more percent above the ASTM D 1557 optimum water content. Unstable materials are also indicated by waving, rutting, and shoving under the wheels and

rollers of construction equipment. Unstable material may be encountered at this site during construction. Unstable conditions in excavations shall be mitigated as specified hereinafter. No additional compensation shall be forthcoming for the extra construction effort, time loss, or any other costs of remediation for unstable conditions.

2.1.2.2 Foundations

The Contractor is notified that remnants of existing subgrade footings may exist at these sites and no additional compensation shall be forthcoming for any additional effort required for the removal and disposal of these.

2.1.3 Initial Backfill Material

Initial backfill material shall consist of the material specified by the conduit or coating manufacturer for the particular trench configuration and loading condition. Where conflicts in specifications exist, the more conservative (as determined by the Contracting Officer) material or alternative shall be utilized. In the absence of a conduit or coating manufacturer's specifications, initial backfill shall consist of select granular material, controlled low strength material, or sand. Select granular material shall be used for bridging and general bedding and initial backfill. Controlled low strength material shall be used for bridging and bedding and initial backfill under heavily loaded areas. Sand shall be used as bedding and initial backfill for conduits that are coated for corrosion protection.

2.1.3.1 Select Granular Material

Select granular material shall consist of sands, gravels, crushed gravel, or crushed stone composed of hard, tough and durable particles. Select granular material shall be graded in accordance with the ASTM C 33 gradation for size 67 concrete coarse aggregate.

2.1.3.2 Controlled Low Strength Material

Controlled low strength material (CLSM) shall meet the requirements specified in ACI 229R and shall consist of a lean concrete slurry of type II portland cement blended with size 7 concrete coarse rounded aggregate conforming to the requirements specified in ASTM C 33. Controlled low strength material shall have a 28-day compressive strength of between 345 and 690 kpa when tested in accordance with ASTM C 39.

2.1.3.3 Sand

Sand shall conform to ASTM C 33 requirements for concrete fine aggregate. Additionally, sand shall have an in-place water content of less than 7 percent as determined by ASTM D 2216.

2.1.4 Plastic Marking Tape

Plastic marking tape shall be acid and alkali-resistant polyethylene film, 152 mm (6 inches) wide with minimum thickness of 0.102 mm (0.004 inch). Tape shall have a minimum strength of 12.1 MPa (1750 psi) lengthwise and 10.3 MPa (1500 psi) crosswise. The tape shall be manufactured with integral wires, foil backing or other means to enable detection by a metal detector when the tape is buried up to 1 meter deep. The tape shall be of a type specifically manufactured for marking and locating underground utilities. The metallic core of the tape shall be encased in a protective

jacket or provided with other means to protect it from corrosion. Tape color shall be as specified in TABLE 1 and shall bear a continuous printed inscription describing the specific utility.

TABLE 1. Tape Color

Red:	Electric
Yellow:	Gas, Oil, Dangerous Materials
Orange:	Telephone, Telegraph, Television, Police, and Fire Communications
Blue:	Water Systems

PART 3 EXECUTION

3.1 EXCAVATION

Excavation shall be performed to the lines and grades indicated. Excavation shall include removal and disposal of material not classified as rock excavation. During excavation, material satisfactory for backfilling shall be stockpiled in an orderly manner at a distance from the banks of the trench equal to 1/2 the depth of the excavation, but in no instance closer than 1 meter. Excavated material not required or not satisfactory for backfill shall be removed from the site and shall be disposed of by the Contractor off of Government-controlled land prior to the completion of construction. Grading shall be done as may be necessary to prevent surface water from flowing into the excavation, and any water accumulating therein shall be removed to maintain the stability of the bottom and sides of the excavation. No additional compensation shall be forthcoming for the excavation and replacement of materials from unauthorized overexcavation or materials rendered unsatisfactory by Contractor managed operations. No additional compensation shall be forthcoming for material excavation and replacement due to the Contractor's failure to protect, drain, or dewater the project site. A change in the Contract price shall be considered for incidents where (in the interpretation of the Contracting Officer) unsatisfactory materials are not the result of Contractor managed operations and are encountered at depths and/or locations that are substantially different from those shown on the Contract Exploration Logs.

3.1.1 Trench Excavation

The trench shall be excavated as recommended by the manufacturer of the conduit to be installed. Trench walls below the top of the pipe shall be sloped, or made vertical, and of such width as recommended in the manufacturer's installation manual. Where no manufacturer's installation manual is available, trench walls shall be made vertical. Trench walls more than 1.5 meters high shall be shored, cut back to a stable slope, or provided with equivalent means of protection for employees who may be exposed to moving ground or cave in. Vertical trench walls more than 1.5 meters high shall be shored. Trench walls which are cut back shall be excavated to at least the angle of repose of the soil. Special attention shall be given to slopes which may be adversely affected by weather or moisture content. Trenches shall be excavated to the width specified by the conduit manufacturer for the particular depth and loading condition.

In the absence of manufacturer specifications the trench shall be excavated to provide a clearance of 75 to 150 mm between the trench wall and the in-place conduit. Where recommended trench widths are exceeded, redesign, stronger pipe, or special installation procedures shall be

utilized by the Contractor. The cost of redesign, stronger pipe, or special installation procedures shall be borne by the Contractor without any additional cost to the Government.

3.1.1.1 Bottom Preparation

The bottoms of trenches shall be accurately graded to provide uniform bearing and support for the bottom of each section of the conduit. Excavation shall be of sufficient depth to provide clearance between the trench and conduit bottoms for conduit bedding.

3.1.1.2 Removal of Unstable Material

Where unstable material is encountered in the bottom of the trench, such material shall be removed to the depth directed and replaced to the proper grade or bridged with select granular material or controlled low strength material as directed.

3.1.1.3 Excavation for Appurtenances

Excavation for manholes, catch-basins, inlets, or similar structures shall be of sufficient size to permit the placement and removal of forms for the full length and width of structure footings and foundations as shown. Rock shall be cleaned of loose debris and cut to a firm surface either level, stepped, or serrated, as shown or as directed. Loose disintegrated rock and thin strata shall be removed. Removal of unstable material shall be as specified above. When concrete or masonry is to be placed in an excavated area, special care shall be taken not to disturb the bottom of the excavation. Excavation to the final grade level shall not be made until just before the concrete or masonry is to be placed.

3.1.1.4 Jacking, Boring, and Tunneling

Unless otherwise indicated, excavation shall be by open cut except that sections of a trench may be jacked, bored, or tunneled if, in the opinion of the Contracting Officer, the pipe, cable, or duct can be safely and properly installed and backfill can be properly compacted in such sections. The Contractor shall vertically and horizontally locate all underground utilities in the vicinity of the operation and shall repair any broken or damaged utilities or pavements at no cost to the Government. The Contractor shall obtain all permits and clearances for the operation. All excavations shall be completely backfilled, compacted, and graded upon completion of testing.

3.1.1.5 Stockpiles

Stockpiles of satisfactory, unsatisfactory, and waste materials shall be placed and graded as specified. Stockpiles shall be kept in a neat and well drained condition, giving due consideration to drainage at all times. The ground surface at stockpile locations shall be cleared, grubbed, and sealed by rubber-tired equipment, excavated satisfactory and unsatisfactory materials shall be separately stockpiled. Stockpiles of satisfactory materials shall be protected from contamination which may destroy the quality and fitness of the stockpiled material. If the Contractor fails to protect the stockpiles, and any material becomes unsatisfactory, such material shall be removed and replaced with satisfactory material from approved sources at no additional cost to the Government. Locations of stockpiles of satisfactory materials shall be subject to prior approval of the Contracting Officer.

3.2 BACKFILLING AND COMPACTION

Backfill material shall consist of satisfactory material and initial backfill material as required. Backfill shall be placed in layers not exceeding 150 mm loose thickness for compaction by hand operated machine compactors, and 200 mm loose thickness for other than hand operated machines, unless otherwise specified. Each layer shall be compacted to densities specified hereinafter.

3.2.1 Trench Backfill

Trenches shall be backfilled to the grade shown. The trench shall be backfilled to 0.6 meters above the top of pipe prior to performing the required pressure tests. The joints and couplings shall be left uncovered during the pressure test and thrust blocks shall be allowed to cure for 48 hours prior to testing. Backfilling shall not be completed until all specified tests are performed and passed.

3.2.1.1 Replacement of Unstable Material

Unstable material removed from the bottom of the trench or excavation shall be replaced or bridged with select granular material or controlled low strength material as directed.

3.2.1.2 Bedding and Initial Backfill

Bedding shall consist of initial backfill material placed to the thickness shown. Care shall be taken to ensure thorough compaction of the bedding under the haunches of the pipe. Initial backfill material shall be placed and compacted with approved tampers to a height of at least one foot above the utility pipe or conduit. The backfill shall be brought up evenly on both sides of the pipe for the full length of the pipe. Initial backfill shall be placed in 6 inch loose lifts, each lift compacted with an approved hand-operated vibratory plate-type compactor until no additional surface elevation changes occur.

3.2.1.3 Final Backfill

The remainder of the trench, except for special materials for roadways, shall be filled with satisfactory material. Placed conduits shall be protected from crushing by construction vehicles during subsequent construction operations. The Contractor shall repair damaged lines at no additional cost to the Government. Backfill material shall be placed and compacted as follows:

a. Under Buildings and Paved Areas: Backfill shall be placed and compacted to a minimum of 95 percent of the maximum laboratory dry density, full depth. Water flooding or jetting methods of compaction will not be permitted.

b. Open Areas: Backfill shall be deposited and compacted to 90 percent of the maximum laboratory dry density. Compaction by water flooding or jetting will not be permitted. This requirement shall also apply to all other areas not specifically designated above.

3.2.2 Backfill for Appurtenances

Appurtenant structures shall be backfilled with satisfactory material.

After the manhole, catchbasin, inlet, or similar structure has been constructed and the concrete has been allowed to cure for 7 days, backfill shall be placed in such a manner that the structure will not be damaged by the shock of falling earth. The backfill material shall be deposited and compacted as specified for final backfill, and shall be brought up evenly on all sides of the structure to prevent eccentric loading and excessive stress.

3.3 SPECIAL REQUIREMENTS

Special requirements for both excavation and backfill relating to the specific utilities are as follows:

3.3.1 Water Lines

To prevent freezing, trenches shall be of a depth to provide a minimum cover of 1 meter from the existing ground surface, or from the indicated finished grade, whichever is lower, to the conduit crown.

3.3.2 Electrical Distribution System

Direct burial cable and conduit or duct line shall have a minimum cover of 600 mm from the finished grade, unless otherwise indicated. Special trenching requirements for direct-burial electrical cables and conduits are specified in Section 16375 ELECTRICAL DISTRIBUTION SYSTEM, UNDERGROUND.

3.3.3 Plastic Marking Tape

Warning tapes shall be installed directly above the pipe, at a depth of 450 mm below finished grade unless otherwise shown.

3.4 TESTING

Testing shall be the responsibility of the Contractor and shall be performed at no additional cost to the Government. Testing shall be performed by an approved commercial testing laboratory subject to approval and meeting the requirements specified in ASTM D 3740.

3.4.1 In-Place Densities

Field in-place density shall be determined in accordance with ASTM D 1556 or ASTM D 2922. When ASTM D 2922 is used, the calibration curves shall be checked and adjusted if necessary by the procedure described in ASTM D 2922, paragraph ADJUSTING CALIBRATION CURVE. ASTM D 2922 results in a wet unit weight of soil and when using this method ASTM D 3017 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall also be checked along with density calibration checks as described in ASTM D 3017. Calibration checks, using ASTM D 1556 and ASTM D 2216, for both the density and moisture gauges shall be made at the beginning of a job and on each different type of material encountered; a minimum one calibration check shall be performed for each set of five nuclear compaction tests.

3.4.2 Moisture-Density Relationships

Moisture-density relationships shall be determined by the test method outlined in ASTM D 1557.

3.4.3 Gradation, Atterberg Limits, and Classification

Gradation testing aggregates shall be performed by the test method outlined in ASTM C 136. Gradation testing for soil materials shall be performed in accordance with ASTM D 422. Atterberg limits shall be determined by ASTM D 4318. Classification shall be determined by the test method outlined in ASTM D 2487.

3.4.4 Miscellaneous Testing

Wear tests for select granular material and controlled low-strength material aggregate shall be performed in accordance with ASTM C 131. Aggregates shall have a loss of no greater than 40 percent when tested with 500 revolutions. A minimum of two compressive strength tests shall be in accordance with ASTM C 39 for each source of controlled low strength material. Sieve size analysis for capillary water barrier material, sand, and controlled low-strength material aggregate shall be performed in accordance with ASTM C 136.

3.4.5 Testing Schedule

The following number of tests, if performed at the appropriate time, shall be the minimum acceptable for each type operation.

(a) Field Density and Moisture Content: For utility trenches, perform one test for each lift or each increment or fraction of 60 meters. For isolated utility appurtenances, one random test during backfilling operations at each location.

(b) Moisture-Density Relationship with Gradation, Atterberg Limits, and Classification: From a bulk sample; one set of tests for every 5 field density tests (with not less than 1 test for each type of material) for the first 25 field density tests. Thereafter, one additional test for each change in material.

(c) Miscellaneous Granular Materials: For select granular material and controlled low-strength material aggregate; perform a minimum of two random sieve size analyses and two wear tests for each material source. Perform a minimum of two sieve size analyses and two water content tests for inplace sand, if used for bedding and initial backfill. A minimum of two compressive strength tests shall be performed for each source of controlled low strength material.

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SECTION 02232

SELECT-MATERIAL SUBBASE COURSE

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 131	(1989) Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM D 75	(1987; R 1992) Sampling Aggregates
ASTM D 422	(1963; R 1990) Particle-Size Analysis of Soils
ASTM D 1556	(1990) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1557	(1991) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu. m.))
ASTM D 2922	(1991) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 3017	(1988) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
ASTM D 3740	(1992) Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
ASTM D 4318	(1984) Liquid Limit, Plastic Limit, and Plasticity Index of Soils

1.2 DEGREE OF COMPACTION

The degree of compaction required is expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 1557, Procedure C. This will be abbreviated herein as percent of laboratory maximum dry density.

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation;

submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL DESCRIPTIONS:

SD-01 Data

Equipment; FIO.

List of proposed equipment to be used in performance of construction work, including descriptive data.

SD-09 Reports

Sampling and Testing; FIO.

Copies of all laboratory and field test reports to the Contracting Officer within 24 hours of the completion of the test. See Part 1, paragraph SAMPLING AND TESTING for a detailed list of the submittals.

SD-18 Records

Sampling and Testing; GA.

The Contractor shall furnish, the name, qualifications and description of the testing facilities of the selected commercial testing laboratory or of the Contractor proposed for use in performing the required tests. Testing facilities and personnel shall meet the requirements outlined in ASTM D 3740.

1.4 EQUIPMENT

All plant, equipment, and tools used in the performance of the work will be subject to approval before the work is started and shall be maintained in satisfactory working condition at all times. The equipment shall be adequate and have the capability of producing the required compaction, meeting grade controls, thickness control and smoothness requirements as set forth herein.

1.5 SAMPLING AND TESTING

Sampling and testing shall be the responsibility of the Contractor. Sampling and testing shall be performed according to the Construction Control Manual CESPAM PAM 415-1-2. Sampling and testing shall be performed by an approved commercial testing laboratory, or by the Contractor facilities meeting the requirements of ASTM D 3740, subject to approval. If the Contractor elects to establish testing facilities of his own, no work requiring testing will be permitted until the Contractor's facilities have been inspected and approved. The first inspection shall be at the expense of the Government and any subsequent inspections required because of failure of the first inspection will be at the expense of the Contractor.

1.5.1 Sampling

Sampling for laboratory testing shall be taken in conformance with ASTM D 75. The sampling may be observed by the Contracting Officer.

1.5.2 Field Density with Moisture Content

Field in-place density shall be determined in accordance with ASTM D 1556 or ASTM D 2922. When ASTM D 2922 is used, the calibration curves shall

be checked and adjusted if necessary by the procedure described in ASTM D 2922, paragraph ADJUSTING CALIBRATION CURVE. ASTM D 2922 results in a wet unit weight of soil and when using this method ASTM D 3017 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall also be checked along with density calibration checks as described in ASTM D 3017. Calibration checks, using ASTM D 1556 and ASTM D 2216, for both the density and moisture gauges shall be made at the beginning of a job and on each different type of material encountered; a minimum one calibration check shall be performed for each set of five nuclear compaction tests.

1.5.3 Miscellaneous Testing

Moisture-density relationships shall be determined by the test method outlined in ASTM D 1557, Procedure C. Gradation testing for soil materials shall be performed in accordance with ASTM D 422. Atterberg limits shall be determined by ASTM D 4318. Resistance to degradation shall be determined with the test method outlined in ASTM C 131. Classification shall be determined by the test method outlined in ASTM D 2487. The materials shall be tested to establish compliance with the specified requirements.

1.5.4 Testing Schedule

The following number of tests, if performed at the appropriate time, shall be the minimum acceptable for each type operation.

(a) Field Density and Moisture Content: Perform two tests per each increment or fraction of 1000 square meters placed during each 8 hour shift.

(b) Gradation with Atterberg Limits: From compacted material; one test for every 5 field density tests.

(c) Moisture-Density Relationship with Gradation, Atterberg Limits, Resistance to Degradation, and Classification: From a bulk sample; one set of tests for every 5 field density tests (with not less than 1 test for each type of material) for the first 25 field density tests. Thereafter, one additional test for each change in material.

1.6 Approval of Material

The source of the material shall be selected 30 days prior to the time the material will be required in the work. Tentative approval of the source will be based on an inspection by the Contracting Officer. Tentative approval of material will be based on tests of samples as outlined in paragraph SAMPLING AND TESTING. Final approval of both the source and the materials will be based on tests for gradation, Atterberg limits, resistance to degradation, specific gravity, and classification. No material shall be delivered to the site without written approval from the Contracting Officer.

1.7 WEATHER LIMITATIONS

Select-material subbase courses shall be constructed when the atmospheric temperature is above 2 degrees C. When the temperature falls below 2 degrees C, the Contractor shall protect all areas of completed select-material subbase course by approved methods against detrimental effects of freezing. Areas of completed select-material subbase course

damaged by freezing, rainfall, or other weather conditions shall be corrected to meet specified requirements without additional cost to the Government.

PART 2 PRODUCTS

2.1 MATERIALS

Materials shall consist of angular materials classified in accordance with ASTM D 2487 as GW, GP, GW-GM, or GP-GM with a maximum particle size of 50 mm in any dimension, and no more than 6 percent by weight passing the 75 um standard sieve. Material shall be free from lumps and balls of clay and from organic and other objectionable matter. The gravel portion shall have a loss of no greater than 40 percent when tested with 500 revolutions in accordance with ASTM C 131.

PART 3 EXECUTION

3.1 OPERATION OF AGGREGATE SOURCES

All clearing, stripping, and excavating work involved in the opening or operation of aggregate sources shall be performed by the Contractor. Aggregate sources shall be opened to expose vertical faces of the deposit for suitable working depths. Materials excavated from aggregate sources shall be obtained in successive vertical cuts extending through all exposed strata. All pockets or strata of unsuitable materials overlying or occurring in the deposit shall be wasted as directed. The methods of operating aggregate sources may be changed or modified by the Contracting Officer when necessary in order to obtain material conforming to specified requirements. Upon completion of work, aggregate sources on Government reservations shall be conditioned to drain readily, and shall be left in a satisfactory condition. Aggregate sources on private lands shall be conditioned in agreement with local laws and approved by local authorities.

3.2 STOCKPILING MATERIAL

If necessary, materials shall be stockpiled in the manner and at locations designated. Prior to stockpiling, the storage sites shall be cleared, drained, and leveled by the Contractor. Approved material available from excavation or grading shall be stockpiled in the manner and at locations designated.

3.3 PREPARATION OF SUBGRADE

Prior to constructing the select-material subbase course, the previously constructed subgrade shall be cleaned of all foreign substances. The surface of the subgrade shall meet specified compaction and surface tolerances. Subgrade for select-material subbase course shall conform to requirements of Section 02210 GRADING. Ruts or soft, yielding spots that may appear in subgrade, areas having inadequate compaction, and deviations of the surface from requirements set forth herein shall be corrected by loosening and removing soft or unsatisfactory material, adding satisfactory material, reshaping to line and grade, and recompacting to specified density requirements.

3.4 GRADE CONTROL

The finished and completed subbase course shall conform to lines, grades, cross sections, and dimensions shown. The lines and grades indicated shall

be maintained by means of line and grade stakes placed by the Contractor at the worksite in accordance with the SPECIAL CLAUSES.

3.5 MIXING AND PLACING MATERIALS

The materials shall be mixed and placed in such a manner as to obtain uniformity of the select subbase material and at a uniform optimum water content for compaction. The Contractor shall make such adjustments in mixing or placing procedures or in equipment as may be directed to obtain the true grades, to minimize segregation and degradation, to reduce or accelerate loss or increase of water, and to insure a satisfactory select-material subbase course.

3.6 LAYER THICKNESS

The compacted thickness of the select-material subbase course shall be as indicated. The select material subbase course shall be constructed in layers with no layer shall exceeding 150 mm or being less than 80 mm in compacted thickness.

3.7 COMPACTION

Each layer of the select-material subbase course shall be compacted with approved compaction equipment. Water content shall be maintained during the compaction procedure such that the water content is within plus or minus 2 percent of optimum water content as determined from laboratory tests as specified in paragraph SAMPLING AND TESTING. In all places not accessible to the rollers, the mixture shall be compacted with hand-operated power tampers. Compaction shall continue until each layer is compacted through the full depth to at least 100 percent of laboratory maximum density. The Contractor shall make such adjustments in compacting or finishing procedures as may be directed to obtain true grades, to minimize segregation and degradation, to reduce or increase water content, and to insure a satisfactory subbase course. Any materials that are found to be unsatisfactory shall be removed and replaced with satisfactory material or reworked as directed to meet the specified requirements.

3.8 EDGES OF SUBBASE COURSE

Acceptable material shall be placed along the edges of the select-material subbase course in such quantity as will compact to the thickness of the course being constructed. When the course is being constructed in two or more layers, at least a .300 m width of the shoulder shall be rolled and compacted simultaneously with the rolling and compacting of each layer of the subbase course, as directed.

3.9 SMOOTHNESS TEST

The surface of each layer shall not deviate more than 10 mm when tested with a 3.05 m (10-foot) straightedge applied parallel with and at right angles to the centerline of the area to be paved. Deviations exceeding this amount shall be corrected by removing material, replacing with new material, or reworking existing material and compacting.

3.10 THICKNESS CONTROL

The thickness of the select-material subbase course shall be measured at intervals providing at least one measurement for each 400 square meters or part thereof of subbase course. The thickness measurement shall be made by

taking differential elevations between the subgrade and surface of the completed subbase course, at preselected locations. The completed subbase course shall not be more than 12.7 mm (1/2-inch) deficient in thickness nor more than 12.7 mm (1/2 inch) above or below the established grade. Where any of these tolerances are exceeded, the Contractor shall correct such areas by scarifying, adding new material of proper gradation or removing material, and compacting, as directed. Where the measured thickness of the subbase course is 12.7 mm (1/2-inch) or more thicker than shown, the course will be considered as conforming with the specified thickness requirements plus 12.7 mm (1/2-inch). The average job thickness shall be the average of the job measurements as specified above but within 6.4 mm (1/4 inch) of the thickness shown.

3.11 MAINTENANCE

The select-material subbase course shall be maintained in a satisfactory condition until accepted.

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SECTION 02241

AGGREGATE BASE COURSE

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 29	(1991a) Unit Weight and Voids in Aggregate
ASTM C 127	(1988) Specific Gravity and Absorption of Course Aggregate
ASTM C 128	(1988) Specific Gravity and Absorption of Fine Aggregate
ASTM C 131	(1989) Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C 136	(1992) Sieve Analysis of Fine and Coarse Aggregates
ASTM D 75	(1987; R 1992) Sampling Aggregates
ASTM D 422	(1963; R 1990) Particle-Size Analysis of Soils
ASTM D 1556	(1990) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1557	(1991) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu. m.))
ASTM D 2922	(1991) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 3017	(1988) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
ASTM D 3740	(1992) Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
ASTM D 4318	(1993) Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM E 11	(1987) Wire-Cloth Sieves for Testing

Purposes

1.2 DEFINITIONS

1.2.1 Aggregate Base

Aggregate base as used herein is well graded, durable aggregate uniformly moistened and mechanically stabilized by compaction.

1.2.2 Degree of Compaction

Degree of compaction required is expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 1557 Procedure C abbreviated hereinafter as percent laboratory maximum dry density.

1.3 GENERAL

The work specified herein consists of the construction of an aggregate base course. The work shall be performed in accordance with this specification and shall conform to the lines, grades, notes and typical sections shown in the plans. Sources of all materials shall be selected well in advance of the time that materials will be required in the work.

1.4 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL DESCRIPTIONS:

SD-01 Data

Plant, Equipment, Machines, and Tools; FIO.

List of proposed equipment to be used in performance of construction work including descriptive data.

SD-09 Reports

Sampling and Testing; FIO. Field Density; FIO.

Calibration curves and related test results prior to using the device or equipment being calibrated. Copies of field test results within 24 hours after the tests are performed. Certified copies of test results for approval not less than 30 days before material is required for the work.

SD-18 Records

Waybills and Delivery Tickets; FIO. Coarse Aggregate; FIO.

Copies of waybills and delivery tickets during the progress of the work. Certified waybills and delivery tickets for all materials actually used. A notification stating which type of coarse aggregate is to be used.

1.5 WAYBILLS AND DELIVERY TICKETS

Copies of waybills or delivery tickets shall be submitted during the

progress of the work. Before the final payment is allowed, waybills and certified delivery tickets shall be furnished for all aggregates actually used in the construction.

1.6 WEATHER LIMITATIONS

Base shall not be constructed when the atmospheric temperature is less than 2 degrees C. Base shall not be constructed on subgrades or subbases that are frozen or contain frost. If the temperature falls below 2 degrees C, completed areas shall be protected against any detrimental effects of freezing.

1.7 PLANT, EQUIPMENT, MACHINES, AND TOOLS

1.7.1 General Requirements

Plant, equipment, machines, and tools used in the work shall be subject to approval and shall be maintained in satisfactory working condition at all times. Other compacting equipment may be used in lieu of that specified, where it can be demonstrated that the results are equivalent. The equipment shall be adequate and have the capability of producing the results specified.

1.7.2 Steel-Wheeled Rollers

Steel-wheeled rollers shall be the self-propelled type weighing not less than 9072 kg, with a minimum weight of 53 kg/cm width of rear wheel. Wheels of the rollers shall be equipped with adjustable scrapers. The use of vibratory rollers is optional.

1.7.3 Pneumatic-Tired Rollers

Pneumatic-tired rollers shall be loaded to weigh a minimum of 13,600 kg and have four or more tires. Tires shall be inflated to a minimum pressure of 1034 kPa. The loading shall be equally distributed to all wheels, and the tires shall be uniformly inflated. Towing equipment shall also be pneumatic-tired.

1.7.4 Mechanical Spreader

Mechanical spreader shall be self-propelled or attached to a propelling unit capable of moving the spreader and material truck. The device shall be steerable and shall have variable speeds forward and reverse. The spreader and propelling unit shall be carried on tracks, rubber tires, or drum-type steel rollers that will not disturb the underlying material. The spreader shall contain a hopper, an adjustable screed, and outboard bumper rolls and be designed to have a uniform, steady flow of material from the hopper. The spreader shall be capable of laying material without segregation across the full width of the lane to a uniform thickness and to a uniform loose density so that when compacted, the layer or layers shall conform to thickness and grade requirements indicated. The Contracting Officer may require a demonstration of the spreader prior to approving use in performance of the work.

1.7.5 Sprinkling Equipment

Sprinkling equipment shall consist of tank trucks, pressure distributors, or other approved equipment designed to apply controlled quantities of water uniformly over variable widths of surface.

1.7.6 Tampers

Tampers shall be of an approved mechanical type, operated by either pneumatic pressure or internal combustion, and shall have sufficient weight and striking power to produce the compaction required.

1.7.7 Straightedge

The Contractor shall furnish and maintain at the site, in good condition, one 3.66 meter (12 foot) straightedge for each bituminous paver, for use in the testing of the finished surface. Straightedge shall be made available for Government use. Straightedges shall be constructed of aluminum or other lightweight metal and shall have blades of box or box-girder cross section with flat bottom reinforced to insure rigidity and accuracy. Straightedges shall have handles to facilitate movement on pavement.

1.8 STOCKPILING MATERIALS

Materials, including approved material available from excavation and grading, shall be stockpiled in the manner and at locations designated. Before stockpiling of material, storage sites shall be cleared, and sloped to drain. Materials obtained from different sources shall be stockpiled separately.

1.9 SAMPLING AND TESTING

1.9.1 General Requirements

Sampling and testing shall be performed by an approved commercial testing laboratory subject to approval and meeting the requirements of ASTM D 3740.

No work requiring testing shall be permitted until the facilities have been inspected and approved. The first inspection shall be at the expense of the Government. Cost incurred for any subsequent inspection required because of failure of the facilities to pass the first inspection will be charged to the Contractor. Tests shall be performed as specified herein after to insure that materials and compaction meet specified requirements.

1.9.2 Test Results

Copies of test results shall be furnished to the Contracting Officer within 24 hours of completion of tests. Results shall verify that materials comply with this specification. When a material source is changed, the new material will be tested for compliance. When deficiencies are found, the initial analysis shall be repeated and the material already placed shall be retested to determine the extent of unacceptable material. All in-place unacceptable material shall be replaced or modified as directed by the Contracting Officer.

1.9.3 Sampling

Aggregate samples for laboratory tests shall be taken in accordance with ASTM D 75.

1.9.4 Field Density with Moisture Content

Field in-place density shall be determined in accordance with ASTM D 1556 or ASTM D 2922. When ASTM D 2922 is used, the calibration curves shall be

checked, and adjusted if necessary, using the sand cone method as described in paragraph Calibration of the ASTM publication. ASTM D 2922 results in a wet unit weight of soil, and when using this method, ASTM D 3017 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall be checked along with density calibration checks as described in ASTM D 3017. If ASTM D 2922 is used, in-place densities shall be checked by ASTM D 1556 and ASTM D 2216 at least once for every 5 nuclear density tests of completed base course. Calibration curves and calibration test results shall be furnished within 24 hours of the conclusion of the tests.

1.9.5 Gradation with Atterberg Limits

Aggregate base course material shall be tested for compliance gradation in accordance with ASTM C 136 and ASTM D 422 on sieves conforming to ASTM E 11. Atterberg limits shall be determined by the test method outlined in ASTM D 4318.

1.9.6 Moisture-Density Relationship

Moisture-density relationships from bulk samples shall be established with the test method outlined in ASTM D 1557, Procedure C.

1.9.7 Wear Tests

Wear tests shall be performed on bulk samples in accordance with ASTM C 131.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Aggregates

Aggregates shall consist of crushed stone, crushed gravel, angular sand, or other approved material. Aggregates shall be durable and sound, free from lumps of clay, organic matter, objectionable coatings, and other foreign material. Material retained on a 4.75 mm sieve shall be known as coarse aggregate and that passing the 4.75 mm sieve shall be known as binder material.

2.1.1.1 Coarse Aggregate

Only one type of coarse aggregate shall be used on the project. Coarse aggregates, consisting of angular fragments of uniform density and quality, shall have a percentage of wear not to exceed 40 percent after 500 revolutions when tested in accordance with ASTM C 131. The amount of flat and elongated particles shall not exceed 30 percent. A flat particle is one having a ratio of width to thickness greater than 3, and an elongated particle is one having a ratio of length to width greater than 3.

a. Crushed Gravel: Crushed gravel shall be manufactured from gravel particles 50 percent of which by weight are retained on the maximum size gradation sieve specified.

b. Crushed Stone: Crushed stone retained on each sieve specified shall contain at least 50 percent by weight of crushed pieces having two or more freshly fractured faces with the area of each face being at least equal to 75 percent of the smallest midsectional area of the piece. When two fractures are adjacent, the angle between the planes

of the fractures must be at least 30 degrees to count as two fractured faces.

2.1.2 Binder Material

Binder material shall consist of screenings, angular sand, or other finely divided mineral matter processed or naturally combined with the coarse aggregate. Liquid-limit and plasticity-index requirements shall apply to any component that is blended to meet the required gradation and shall also apply to the completed course. The portion of any component or of the completed course passing the 0.425 mm sieve shall be either nonplastic or have a liquid limit not greater than 25 and a plasticity index not greater than 5.

2.1.3 Gradation

Requirements for gradation specified shall apply to the completed base course. The aggregates shall have a 37.5 mm maximum size and shall be continuously graded within the following limits:

Sieve Designation	Percent by Weight Passing Square-mesh Sieve (a)(b)(c)
37.5 mm	100
25 mm	-----
19 mm	81-91
12.5 mm	67-77
9.5 mm	-----
4.75 mm	43-53
1.18 mm	23-29
75 um	6-10

(a) Similar to the 37.5 mm Gradation from Table 301-1, Section 301 of the State of Utah Department of Transportation *Metric Standard Specifications for Road and Bridge Construction*.

(b) Particles having diameters less than 0.02 mm shall not be in excess of 3 percent by weight of the total sample tested.

(c) The values are based on aggregates of uniform specific gravity, and the percentages passing the various sieves are subject to appropriate correction in accordance with ASTM C 127 and ASTM C 128 when aggregates of varying specific gravities are used.

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

When the base is constructed in more than one layer, the previously constructed layer shall be cleaned of loose and foreign matter by sweeping with power sweepers or power brooms, except that hand brooms may be used in areas where power cleaning is not practicable. Adequate drainage shall be provided during the entire period of construction to prevent water from collecting or standing on the working area. Line and grade stakes shall be provided as necessary for control. Grade stakes shall be in lines parallel to the centerline of the area under construction and suitably spaced for string lining.

3.2 OPERATION OF AGGREGATE SOURCES

Aggregates shall be obtained from off-site sources.

3.3 PREPARATION OF UNDERLYING COURSE

3.3.1 General Requirements

Before constructing aggregate base course, the previously constructed underlying course shall be cleaned of foreign substances. Surface of underlying course shall meet the specified compaction and surface tolerances. Subgrade shall conform to Section 02210 GRADING. Subbase course shall conform to Section 02232 SELECT-MATERIAL SUBBASE COURSE. Ruts or soft, yielding spots that may appear in the underlying course, areas having inadequate compaction, and deviations of the surface from requirements specified shall be corrected. For cohesionless underlying materials containing sands, sand gravels, or any other cohesionless material in harmful quantities, the surface shall be mechanically stabilized with aggregate prior to placement of the aggregate base course. Stabilization may be accomplished by mixing base course material into the underlying course and compacting by approved methods. Properly compacted material will be considered as part of the underlying course and shall meet all requirements for the underlying course. Finished underlying course shall not be disturbed by traffic or other operations and shall be maintained in a satisfactory condition until base course is placed.

3.3.2 Grade Control

Underlying material shall be excavated to sufficient depth for the required base course thickness so that the finished base course with the subsequent surface course will meet the fixed grade. Finished and completed area shall conform to the lines, grades, cross section, and dimensions indicated.

3.4 INSTALLATION

3.4.1 Mixing and Placing

Materials shall be mixed by the stationary plant, traveling plant, or road mix method and placed in such a manner as to obtain uniformity of the aggregate base course material and at a uniform optimum water content for compaction. The Contractor shall make such adjustments in mixing or placing procedures or in equipment to obtain the true grades, to minimize segregation and degradation, to reduce or accelerate loss or increase of water, and to ensure a satisfactory base course.

3.4.2 Edges of Base Course

Approved material shall be placed along edges of aggregate base course in such quantities as will compact to thickness of the course being constructed, or to the thickness of each layer in a multiple layer course, allowing in each operation at least a 300 mm width of the shoulder to be rolled and compacted simultaneously with rolling and compacting of each layer of base course.

3.4.3 Compaction

Each layer of aggregate base course [including shoulders] shall be compacted. Water content shall be maintained at optimum. Density of compacted mixture shall be at least 100 percent of laboratory maximum

density. Rolling shall begin at the outside edge of the surface and proceed to the center, overlapping on successive trips at least one-half the width of the roller. Alternate trips of the roller shall be slightly different lengths. Speed of the roller shall be such that displacement of the aggregate does not occur. Areas inaccessible to the rollers shall be compacted with mechanical tampers, and shall be shaped and finished by hand methods.

3.4.4 Layer Thickness

Compacted thickness of the aggregate course shall be as indicated. No layer shall be in excess of 150 mm nor less than 75 mm in compacted thickness.

3.4.5 Finishing

The surface of the top layer shall be finished to grade and cross section shown. Finished surface shall be of uniform texture. Light blading during compaction may be necessary for the finished surface to conform to the lines, grades, and cross sections. Should the surface for any reason become rough, corrugated, uneven in texture, or traffic marked prior to completion, such unsatisfactory portion shall be scarified, reworked, recompacted, or replaced as directed.

3.4.5.1 Smoothness

Surface of each layer shall show no deviations in excess of 9.5 mm (3/8 inch) when tested with the 3.66 meter (12-foot) straightedge. Deviations exceeding this amount shall be corrected by removing material and replacing with new material, or by reworking existing material and compacting, as directed.

3.4.5.2 Thickness Control

Compacted thickness of the base course shall be within 12.7 mm (1/2 inch) of the thickness indicated. Where the measured thickness is more than 12.7 mm (1/2 inch) deficient, such areas shall be corrected by scarifying, adding new material of proper gradation, reblading, and recompacting as directed. Where the measured thickness is more than 12.7 mm (1/2 inch) thicker than indicated, the course shall be considered as conforming to the specified thickness requirements. Average job thickness shall be the average of all thickness measurements taken for the job, but shall be within 6.4 mm (1/4 inch) of the thickness indicated.

3.5 FIELD QUALITY CONTROL

3.5.1 Field Density With Moisture Content

Perform two field density tests with moisture contents for each increment or fraction of 1000 square meters placed during each 8 hour shift.

3.5.2 Gradation With Atterberg Limits

Before starting work, at least one sample of material shall be tested for gradation and Atterberg limit compliance. After the initial test, perform two sets of tests, on compacted material, for every 5 field density tests.

3.5.3 Moisture-Density Relationship

Perform one moisture-density relationship test for every 5 field density tests (with not less than 1 test for each type of material).

3.5.4 Wear Tests

One wear test shall be run for every five field density tests (with not less than 1 test for each type of material).

3.5.5 Smoothness

Measurements for deviation from grade and cross section shown shall be taken in successive positions parallel to the road centerline with a 3.66 meter (12-foot) straightedge. Measurements shall also be taken perpendicular to the road centerline at 15 meter intervals.

3.5.6 Thickness

Thickness of the base course shall be measured at intervals in such a manner as to ensure one measurement for each 250 square meters of base course. Measurements shall be made by taking differential elevations at preselected locations between the subgrade and the top of the completed base course. Locations and subgrade elevations shall be delivered to the Contracting Officer prior to base course placement. Locations and top of base course elevations shall be delivered to the Contracting Officer within 24 hours of base course completion.

3.6 TRAFFIC

Completed portions of the area may be opened to traffic, provided there is no marring or distorting of the surface by the traffic. Heavy equipment shall not be permitted except when necessary to construction, and then the area shall be protected against marring or damage to the completed work.

3.7 MAINTENANCE

The aggregate base course shall be maintained in a satisfactory condition until accepted. Maintenance shall include immediate repairs to any defects and shall be repeated as often as necessary to keep the area intact.

3.8 DISPOSAL OF UNSATISFACTORY MATERIALS

Removed in-place materials that are unsuitable for the base course material that is removed for the required correction of defective areas, and waste material and debris shall be disposed of as directed.

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SECTION 02285

SOIL TREATMENT FOR SUBTERRANEAN RODENT AND TERMITE CONTROL

PART 1 GENERAL

1.1 REFERENCES

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL DESCRIPTIONS:

SD-01 Data

Qualifications; FIO.

Qualifications of the pesticide applicator.

SD-06 Instructions

Pesticides; FIO.

Manufacturer's label and Material Safety Data Sheet (MSDS) for pesticides proposed for use.

SD-14 Samples

Pesticides; FIO.

Samples of the pesticides used in this work, upon request.

1.3 QUALIFICATIONS OF PESTICIDE APPLICATORS

The pesticide applicator's principal business shall be pest control and the pesticide applicator shall be State certified in the U.S. Environmental Protection Agency (EPA) pesticide applicator category which includes structural pest control, and certified in the State.

1.4 DELIVERY, STORAGE, AND HANDLING

Pesticides shall be delivered to the project site in sealed and labeled containers in good condition as supplied by the manufacturer or formulator.

Pesticides shall be stored, handled, and used in accordance with manufacturer's labels. Labels shall bear evidence of registration under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), as amended.

1.5 SAFETY REQUIREMENTS

The Contractor shall formulate, treat, and dispose of termiticides and their containers in accordance with label directions. Water for formulating shall only come from sites designated by the Contracting Officer, and filling hose shall be fitted with a backflow preventer meeting local plumbing codes or standards. Overflow shall be prevented during the filling operation. Pesticides and related materials shall be kept under lock and key when unattended. Proper protective clothing and equipment shall be worn and used during all phases of termiticide application.

1.6 WARRANTY

The Contractor shall provide a 5-year written warranty against infestations by rodents or insects of the facilities constructed under this contract. Warranty shall include annual inspections of the facilities. If live rodent or insect infestation or damage is discovered during the warranty period, and the soil and building conditions have not been altered in the interim, the Contractor shall:

- a. Re-treat the soil and perform other treatment as may be necessary for elimination of rodent and insect infestation;
- b. Repair damage caused by rodent and insect infestation; and
- c. Reinspect the facilities approximately 180 days after the retreatment.

PART 2 PRODUCTS

2.1 MATERIALS

Termiticides and rodenticides shall be currently registered by the EPA.

PART 3 EXECUTION

3.1 VERIFICATION OF CONDITIONS

At the time of application, the soil moisture content shall be sufficiently low to allow uniform distribution of the treatment solution throughout the soil. Applications shall not be made during or immediately following heavy rains or when conditions may cause runoff and create an environmental hazard.

3.2 APPLICATION

3.2.1 Treatment of New Structures

The Contractor shall establish complete and unbroken vertical and/or horizontal (as necessary) soil poison barriers between the soil and all portions of the intended structure which may allow rodent and termite access to wood, wood related products, and polyethylene sheeting. Surface treatments shall not be made for areas to serve as crawl spaces. Termiticide shall be applied as a coarse spray and provide uniform distribution unto the soil surface. Treatment shall be applied prior to placement of a vapor barrier or waterproof membrane and at least 12 hours prior to concrete placement. Where treated soil or fill material is not to be covered with a vapor barrier or waterproof membrane, adequate precautions shall be taken to prevent its disturbance. Soil or fill material disturbed after treatment shall be re-treated as specified above before placement of slabs or other covering structures. Treatment of the soil on the exterior sides of foundation walls, grade beams, and similar structures shall be coordinated with final grading and planting operations so as to avoid disturbance of the treated barriers. Manufacturer's warnings and precautions shall be observed in the handling and use of such materials. Care shall be taken to prevent these chemicals from entering water supply systems, potable water supplies, or aquifers; and that they do not endanger plants or animals. The Contracting Officer shall be notified

at least 48 hours prior to beginning of treatment and formulating, mixing, and application shall be performed in the presence of the Contracting Officer's representative.

3.2.2 Rates and Methods of Application

Rates and methods of application shall be in accordance with the manufacturer's instructions on the pesticide label. Maximum application or dosage rates shall be used. If the pesticide contains less than the amount of active ingredient specified on the label, work shall be repeated with pesticides conforming to this specification.

3.3 DISPOSAL

The Contractor shall dispose of residual pesticides and containers off Government property in accordance with label instructions and EPA criteria.

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SECTION 02513

BITUMINOUS COURSE
(CENTRAL-PLANT HOT MIX)

PART 1 GENERAL

1.1 SUMMARY (Not Applicable)

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 88	(1990) Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C 127	(1988; R1993) Specific Gravity and Absorption of Course Aggregate
ASTM C 128	(1993) Specific Gravity and Absorption of Fine Aggregate
ASTM C 131	(1989) Resistance to Degradation of Small-Sized Course Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C 136	(1993) Sieve Analysis of Fine and Coarse Aggregates
ASTM D 5	(1986) Penetration of Bituminous Materials
ASTM D 75	(1987; R1992) Sampling Aggregates
ASTM D 140	(1993) Sampling Bituminous Materials
ASTM D 242	(1985; R 1990) Mineral Filler for Bituminous Paving Mixtures
ASTM D 1559	(1992) Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus
ASTM D 2041	(1991) Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
ASTM D 3381	(1992) Viscosity-Graded Asphalt Cement for Use in Pavement Construction
ASTM D 3666	(1993) Minimum Requirement for Agencies Testing and Inspecting Bituminous Paving Materials

U.S. ARMY CORPS OF ENGINEERS, Sacramento District

CESPK PAM 415-1-2

Construction Control Manual; Sampling &
Testing Construction Materials/Reporting
Test Results

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL DESCRIPTIONS:

SD-09 Reports

Bituminous Pavement; GA.

Copies of test results.

1.4 PLANT, EQUIPMENT, MACHINES, AND TOOLS

1.4.1 Mixing Plants

Mixing plant shall be a weigh-batch, continuous-mix type or dryer drum type and operated so as to produce a mixture within the job-mix formula. The plant shall have a minimum capacity of 90 metric tons per hour.

1.4.2 Other Equipment

1.4.2.1 Spreaders

Bituminous-materials spreaders shall be self-propelled, capable of producing a finished surface conforming to the smoothness requirements specified hereinafter. The use of a spreader that leaves indentations or other objectionable irregularities in the freshly-laid mix is not permitted.

1.4.2.2 Blowers and Brooms

Blowers and brooms shall be of the power type suitable for cleaning the surface to be paved.

1.4.2.3 Saws

Saws shall be of the power type, capable of rapidly cutting pavement and trimming joints and edges of pavement.

1.4.2.4 Small Tools

Small tools available on the work shall consist of the following: rakes, lutes, shovels, tampers, smoothing irons, pavement cutters, portable heater for heating small tools, wood sandles and stilt sandals of standard type, and other small tools as may be required. A sufficient number shall be available at all times. The lutes shall be constructed of metal and shall consist of a plate or sheet 1 meter x 0.1 meter attached to a handle properly braced. Hand tampers shall weigh not less than 12 kg and have a tamping face not larger than 320 square centimeters.

1.4.2.5 Straightedge

The Contractor shall furnish and maintain at the site, in good condition, one 3.65 meter (12-foot) straightedge for each bituminous paver. The straightedge shall be made available for Government use. Straightedges shall be constructed of aluminum or other lightweight metal and shall have blades of box-girder cross section with flat bottom reinforced to insure rigidity and accuracy. Straightedges shall have handles to facilitate movement on the pavement.

1.4.3 Rollers

The minimum number of rollers for each spreader shall be one 2-axle tandem roller and one pneumatic-tired roller, with separate operator for each roller.

1.4.3.1 Steel Wheeled Rollers

Steel-wheel rollers shall be a self-propelled 2-axle tandem roller weighing not less than 9 metric tons. The rollers shall have adjustable wheel scrapers, water tanks, and sprinkling apparatus to keep the wheels sufficiently wet to prevent the bituminous mixture from sticking to the wheels. The rollers shall be capable of reversing without backlash and shall be free from worn parts. The roller wheels shall not have flat or pitted areas or projections that will leave marks in the pavement.

1.4.3.2 Pneumatic-tired Rollers

Pneumatic-tired rollers shall be self-propelled and shall consist of two axles on which are mounted multiple pneumatic-tired wheels in such manner that the rear group of wheels will not follow in the tracks of the forward group but spaced to give essentially uniform coverage with each pass. Axles shall be mounted in a rigid frame provided with a loading platform or body suitable for ballast loading. Tires shall be smooth and capable of being inflated to at least 620 kPa. Construction of roller shall be such that each wheel can be loaded to a minimum of 2100 kg.

1.5 WEATHER LIMITATIONS

Bituminous course shall be constructed only when base course and existing pavement is dry. Unless otherwise directed, bituminous course shall not be constructed when temperature of the surface of existing pavement or base course is below 5 degrees C.

PART 2 PRODUCTS

2.1 AGGREGATES

Aggregates shall consist of crushed stone, crushed gravel, screenings, sand, and mineral filler. Aggregates shall have a satisfactory service record in bituminous pavement construction, and the source selected shall be approved by the Contracting Officer. The combined aggregates and mineral filler shall meet the requirements of subsequent paragraphs AGGREGATE GRADATION and COMPOSITION OF MIXTURE.

2.1.1 Coarse Aggregates

Coarse aggregate shall consist of clean, sound, durable particles meeting the following requirements:

- a. Loss not greater than 40 percent after 500 revolutions when tested

in accordance with ASTM C 131.

b. Loss not greater than 12 percent after five cycles of testing in accordance with ASTM C 88, using sodium sulfate.

c. At least 50 percent by weight of the aggregates retained on the 4.74 mm sieve shall have at least two fractured faces.

2.1.2 Fine Aggregates

Fine aggregate shall consist of clean, sound, durable, angular particles produced by crushing stone or gravel that meet the requirements for wear and soundness specified for coarse aggregates. This requirement shall apply to material before blending with natural sand when blending is necessary.

2.1.3 Mineral Filler

Material passing the 75 um sieve shall be known as mineral filler, and shall conform to ASTM D 242.

2.1.4 Aggregate Gradation

The aggregate gradation as determined by ASTM C 136 shall fall within the limits of the following:

Sieve Designation	Percent by Weight Passing Square-mesh Sieve (a)
25 mm	100
19 mm	----
12.5 mm	71-91
9.5 mm	62-82
4.75 mm	43-59
2.36 mm	26-40
1.18 mm	14-28
300 um	5-17
75 um	2-6

(a) Similar to the Utah Gradation: 19 mm (crushed) gradation of Section 402 of the State of Utah Department of Transportation *Metric Standard Specifications for Road and Bridge Construction*.

2.2 BITUMINOUS MATERIAL

Bituminous material to be mixed with the mineral aggregates shall be paving asphalt conforming to ASTM D 3381, Viscosity-Graded Asphalt Cement for Use in Pavement Construction as listed in Table of the ASTM D 3381, Requirements for Asphalt Cement Viscosity-Graded at 60 degrees C. Paving asphalt viscosity grade shall be AC 10. Certified results of tests conducted in accordance with ASTM D 5 shall be submitted in advance of any paving, showing the penetration at 25 degrees C for the AR grades of asphalt that will actually be used in the paving mix of this project. In addition, the penetration range at 25 degrees C shall be 25.

2.3 COMPOSITION OF MIXTURE

2.3.1 Job-Mix Formula

The job-mix formula shall be performed in accordance with ASTM D 1559 and shall be submitted by the Contractor a minimum of 30 days prior to the commencement of paving operations. No bituminous mixture shall be manufactured until it has been approved by the Contracting Officer. Data shall be presented with respect to the asphalt cement content in tabulated form, as well as graphical form, and shall include curves for unit weight, percent voids of total mix, percent voids filled, stability, and the optimum asphalt content. Additionally, the formula shall indicate the percentage and specific gravity of each bin fraction of aggregate, percentage absorption and specific gravity of asphalt, temperature of the mixture as discharged from the mixer; and test results which show that the job mix formula will produce a bituminous mixture which meets all requirements of this specification. Previously established test results will be acceptable provided that the tests were performed within the last six months. The asphalt in the job-mix formula shall be between 4.5% and 7.5% of the weight of the total mix. If requested by the Contracting Officer, samples of the aggregates and asphalt shall be submitted for approval of the job-mix formula.

2.3.2 Test Properties of Bituminous Mixtures

2.3.3 Nonabsorptive Aggregate

When the water absorption value of the entire blend of aggregate does not exceed 2.5 percent as determined by ASTM C 127 and ASTM C 128, aggregate is designated as nonabsorptive. The test method outlined in ASTM D 2041 may be utilized for the determination of the theoretical maximum specific gravity and density of the paving mixture providing that the mixture meets the requirements of Table 1. The apparent specific gravity shall be used in computing the voids total mix and voids filled with bitumen. Stability and flow shall be determined in accordance with ASTM D 1559. The mixture shall meet the requirements of Table 1 herein.

TABLE 1. NONABSORPTIVE AGGREGATE MIXTURE

Test Property	50-Blow Compaction
Stability, minimum, Newtons	4450
Flow, 0.25 mm units	8 minimum, 20 maximum
Voids total mix, percent	3-5
Voids filled with bitumen, percent	75-85

2.3.4 Absorptive Aggregate

When the water absorption value of the entire blend of aggregate exceeds 2.5 percent as determined in ASTM C 127 and ASTM C 128, the aggregate is designated as absorptive. The test method outlined in ASTM D 2041 may be utilized for the determination of the theoretical maximum specific gravity and density of the paving mixture providing that the mixture meets the requirements of Table 2. If ASTM D2041 is used for the specific gravity, the physical test properties should meet the requirements of Table 1. Bulk-impregnated specific gravity shall be used in computing the percentages of voids total mix and voids filled with bitumen. Stability and flow shall be determined in accordance with ASTM D 1559. The mixture shall meet the requirements in Table 2, herein.

TABLE 2. ABSORPTIVE AGGREGATE MIXTURE

Test Property	50-Blow Compaction
Stability, minimum, Newtons	4450
Flow, 0.25 mm units	8 minimum, 20 maximum
Voids total mix, percent	2-4
Voids filled with bitumen, percent	80-90

2.3.5 Stripping of Aggregates

After 24 hours immersion in water bath controlled at a temperature of 60 degrees C., the retained stability of job-mix formula test specimens shall be at least 75 percent of the stability of companion specimens prepared for the job-mix formula when tested in accordance with ASTM D 1559. If the retained stability is less than the required 75 percent, the aggregates shall be either rejected or treated by one of the following procedures until the retained stability reaches the required 75 percent: (1) Addition of heat-stable additives to bitumen; (2) addition of hydrated lime, or other cementitious material containing free lime, as a portion of the mineral filler.

PART 3 EXECUTION

3.1 SAMPLING AND TESTING

The testing laboratory and all field and laboratory testing personnel shall meet the requirements specified in ASTM D 3666. Aggregate sampling shall be performed in accordance with ASTM D 75. Bituminous materials shall be sampled in accordance with ASTM D 140. All 100 mm in diameter core samples shall be suitable to determine conformance with stability, density, thickness and other specified requirements. An approved core drill shall be used for cutting samples. The Contractor shall furnish all tools, labor, and materials for cutting samples, testing, and replacing the pavement where samples were removed, to the satisfaction of the Contracting Officer.

3.1.1 Testing Frequency

All sampling and control testing for construction of the pavement shall be performed by the Contractor in accordance with the requirements outlined in Chapter 4 of CESPAM 415-1-2 except that the metric versions of the referenced ASTM standards shall be used.

a. Asphalt: Collect a 1 liter sample of asphalt and the refinery certification. Resample anytime the bituminous material source changes.

b. Aggregate: Collect a minimum of two 23 kg samples of mix aggregate from the hot bins; one sample at the beginning of each 8-hour shift and the other at mid-shift. Each 23 kg sample shall be split in half. The two half-samples (from the beginning and mid-shift) shall be labeled and packed separately and submitted to the Contracting Officer within 24 hours of sampling. Retain two half-samples for QC testing.

c. Hot Mix: Collect a minimum of two 12 kg samples of hot mix from the belt or transport truck; one sample at the beginning of each 8-hour shift and the other at mid-shift. Each 12 kg sample shall be split in half. The two half-samples (from the beginning and mid-shift) shall be labeled and

packed separately and submitted to the Contracting Officer within 24 hours of sampling. Retain two half-samples for QC testing.

d. Core Specimens: Collect 1 set of 5 cores per each hot mix sample collected (2 cores from the centerline of joints). Number cores and note the locations obtained on the as-built drawings. From each set, 2 cores shall be submitted to the Contracting Officer (1 core from a joint centerline). Retain remaining cores for QC testing. Testing shall be in accordance with the Marshall test procedures of ASTM D 1559 and shall meet or surpass the requirements specified herein before. No payment will be made for areas of pavement deficient in composition, density, or thickness until they are removed and replaced by the Contractor as directed by the Contracting Officer.

e. Smoothness Testing: Perform testing at 15 meter intervals along the section centerlines of the parking areas and access ways as specified in the paragraph SURFACE REQUIREMENTS.

3.2 TREATMENT OF UNDERLYING SURFACE

Prior to laying a bituminous course, the underlying surface shall be cleaned of loose and foreign matter by sweeping with power sweepers, power brooms, and hand brooms, as directed. The surface to be paved shall receive a prime coat conforming to Section 02559 BITUMINOUS PRIME COAT.

3.3 MIXING

Temperature of asphalt at time of mixing shall not exceed 163 degrees C when asphalt is added.

3.4 TRANSPORTATION OF BITUMINOUS MIXTURE

The bituminous mixture shall be transported from the mixing plant to the site in trucks having tight, clean, smooth bodies with a minimum coating of concentrated solution of hydrated lime and water to prevent adhesion of the mixture. Each load of mixture shall be covered with canvas or other suitable material to protect the mixture from the weather and to prevent loss of heat. Mixtures having temperatures greater than 163 degrees C, mixtures having temperatures less than 118 degrees C, or mixtures which foam or show indications of moisture will be rejected. Hauling over freshly laid material is not permitted.

3.5 PLACING

Contact surfaces of previously constructed pavement, curbs, manholes, or other structures shall be sprayed with a thin coat of bituminous tack coat in accordance with Section 02558 BITUMINOUS TACK COAT. The mechanical spreader shall be adjusted and its speed regulated so that the course being placed will be smooth and continuous without tears and pulling. The course will be of such depth that after compaction, the cross section, grade, and contour will be as shown on the drawings. In areas where the use of machine spreading is impractical, the mixture shall be spread by hand. Unless otherwise directed, placing shall begin on the high side of areas with a one-way slope or along the centerline of areas with a crowned section and shall be in the direction of the main traffic flow. Placing of the mixture shall be as continuous as possible, and the speed of placing shall be adjusted to permit proper rolling.

3.6 COMPACTION OF ASPHALT MIXTURE

Compaction of asphalt mixture shall be accomplished by the steel wheel rollers and pneumatic-tired roller specified above.

3.6.1 Rolling

Rolling shall begin as soon after placing as the mixture will support the roller without undue displacement. Breakdown rolling shall consist of at least three coverages of a layer of asphalt mixture with a steel wheel roller, immediately followed by at least three coverages with a pneumatic-tired roller. A coverage is defined to be as many passes in either direction as may be necessary to cover the entire width of lane with overlap between passes. Each layer shall be additionally compacted by a final rolling of not less than one coverage with a 2-axle tandem roller. The speed of the rollers shall not exceed 3 miles per hour and rolling shall be performed in such a manner to avoid cracking, shoving, or displacement of the hot mixture.

3.6.1.1 Vibratory Steel Wheeled Rollers

Use of vibratory steel wheel roller for breakdown and finish rolling is subject to prior approval. Vibratory roller shall be operated with the vibratory units off for finish rolling. The maximum weight of the vibratory roller shall not exceed 45 kN.

3.6.1.2 Mixture Density

The bituminous mixture shall be compacted to at least 95 percent of the density of the laboratory specimen of the same mixture subjected to 50 blows of a standard Marshall hammer on each side of the specimen. In areas not accessible to the roller the mixture shall be compacted with hot hand tampers. The compacted surface shall be smooth and free from roller marks, ruts, humps, depressions, or irregularities.

3.6.1.3 Compacted Thickness

The mixture shall be placed in one lift and compacted to the thicknesses indicated within the tolerances specified herein.

3.7 JOINTS AND EDGES

Joints between old and new pavements or between successive day's work, or joints that have become cold because of delay, shall be made to insure continuous bond between old and new sections of course. All joints shall have the same texture, density, and smoothness as other sections of course.

Contact surfaces of previously constructed pavements that have become coated with dust, sand or other objectionable material shall be cleaned by brushing or cut back with approved power saw, as directed. The surface against which new material is placed shall be sprayed with a thin, uniform coat of bituminous tack coat.

3.7.1 Transverse Joints

The roller shall pass over the unprotected end of freshly placed mixture only when placing of course is discontinued or when delivery of mixture is interrupted to the extent that unrolled material may become cold. In all cases, edge of the previously placed course shall be sawn back to expose an even, vertical surface the full thickness of the course.

3.7.2 Longitudinal Joints

Edges of previously placed strip that have cooled or are irregular, honeycombed, poorly compacted, damaged, or otherwise defective, and unsatisfactory sections of the joint shall be sawn back to expose clean, sound surface for full thickness of the course as directed.

3.7.3 Pavement Edges

Edges of pavement adjacent to shoulders shall be trimmed neatly to line. An earth berm of selected material not less than 0.3 meters wide shall be placed against and to the full height of the pavement surface as soon as practicable after final rolling has been completed and pavement has sufficiently hardened.

3.8 PROTECTION OF PAVEMENT

No vehicular traffic shall be permitted on the pavement for at least 6 hours after final rolling.

3.9 SURFACE REQUIREMENTS

The finished surface shall not vary more than 6 mm (1/4-inch) from a 3.66 meter straightedge. The straightedge shall be furnished by the Contractor.

Defective areas and any other areas that impound surface water shall be corrected by and at the expense of the Contractor. Straightedge testing shall be performed as a Contractor Quality Control requirement to demonstrate compliance.

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SECTION 02558

BITUMINOUS TACK COAT

PART 1 GENERAL

1.1 SUMMARY (Not Applicable)

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY OF TESTING AND MATERIALS (ASTM)

ASTM D 140	(1988; R1993) Sampling Bituminous Materials
ASTM D 977	(1991) Emulsified Asphalt
ASTM D 2397	(1991) Cationic Emulsified Asphalt
ASTM D 2995	(1984; R 1989) Determining Application Rate of Bituminous Distributors
ASTM D 3666	(1993) Minimum Requirement for Agencies Testing and Inspecting Bituminous Paving Materials

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300SUBMITTAL DESCRIPTIONS:

SD-09 Reports

Tests; FIO.

Copies of all test results, within 24 hours of completion of tests. Certified copies of the manufacturer's test reports indicating compliance with applicable specified requirements, not less than 30 days before the material is required in the work.

1.4 PLANT, EQUIPMENT, MACHINES AND TOOLS

1.4.1 General Requirements

All plant, equipment, machines and tools used in the work shall be subject to approval and shall be maintained in a satisfactory working condition at all times.

1.4.2 Bituminous Distributor

The distributor shall have pneumatic tires of such size and number to prevent rutting, shoving or otherwise damaging the base surface or other

layers in the pavement structure. The distributor shall be designed and equipped to spray the bituminous material in a uniform coverage at the specified temperature, at readily determined and controlled rates with an allowable variation from the specified rate of not more than plus or minus 5 percent, and at variable widths. Distributor equipment shall include a separate power unit for the bitumen pump, full-circulation spray bars, tachometer, pressure gauges, volume-measuring devices, adequate heaters for heating of materials to the proper application temperature, a thermometer for reading the temperature of tank contents, and a hand hose attachment suitable for applying bituminous material manually to areas inaccessible to the distributor. The distributor shall be equipped to circulate and agitate the bituminous material during the heating process.

1.4.3 Power Brooms and Power Blowers

Power brooms and power blowers shall be suitable for cleaning the surfaces to which the tack coat is to be applied.

1.5 WEATHER LIMITATIONS

Tack coat shall be applied only when the surface to receive the tack coat is dry. Tack coat shall be applied only when the atmospheric temperature in the shade is 10 degrees C or above and when the temperature has not been below 1.7 degrees C for the 12 hours prior to application.

PART 2 PRODUCTS

2.1 BITUMINOUS MATERIAL

Anionic emulsified asphalt shall conform to ASTM D 977 Grade SS-1.
Cationic emulsified asphalt shall conform to ASTM D 2397 Grade CSS-1.

PART 3 EXECUTION

3.1 PREPARATION OF EMULSION

Bituminous materials for emulsions shall be diluted by adding equal volumes of bituminous material and compatible water. If the bituminous material is to be diluted in the field, first test the mix by placing equal volumes of emulsion and water in a glass quart jar (do not use a metal container, as it could cause the mixture to "break") and mix for one minute. If the mixture "breaks", a different source of water or bituminous material is required.

3.2 PREPARATION OF SURFACE

Immediately before applying the tack coat all loose material, dirt, clay, or other objectionable material shall be removed from the surface to be treated. The area to be tacked shall be dry and clean.

3.3 APPLICATION RATE

Bituminous material for the tack coat shall be applied in quantities of not less than 0.20 liters nor more than 0.57 liters per square meter of pavement surface. The exact quantities within the range specified, which may be varied to suit field conditions, will be determined by the Contracting Officer.

3.4 APPLICATION TEMPERATURE

Asphalt application temperature shall provide an application viscosity between 10 and 60 seconds, Saybolt Furol, or between 20 and 120 centistokes, kinematic. The temperature viscosity relation shall be furnished to the Contracting Officer.

Emulsions

SS-1	21-60 degrees C
CSS-1	21-60 degrees C

3.5 APPLICATION

Following preparation and subsequent inspection of the surface, the tack coat shall be applied at the specified rate with uniform distribution over the surface to be treated. All areas and spots missed by the distributor shall be properly treated with the hand spray. Following application of the tack material and prior to the placement of the bituminous course, the tack shall be allowed to cure and to obtain evaporation of any volatiles or moisture. Until the bituminous course is placed, the tacked area shall be maintained by protecting the surface against damage and by repairing and retacking deficient areas at no additional cost to the Government. If required, clean dry sand shall be spread to effectively blot up any excess bituminous material.

3.6 FIELD QUALITY CONTROL

Samples of the bituminous material used will be obtained by the Contractor as directed, under the supervision of the Contracting Officer. The sample will be retained and tested by the Government at no cost to the Contractor.

3.7 SAMPLING AND TESTING

3.7.1 Sampling

The samples of bituminous material, unless otherwise specified, shall be in accordance with ASTM D 140.

3.7.2 Initial Sampling and Testing

3.7.2.1 Bituminous Materials

Sources from which bituminous materials are to be obtained shall be selected and notification thereof furnished the Contracting Officer within 15 days after the award of the contract.

3.7.2.2 Calibration Test

The Contractor shall furnish all equipment, materials, and labor necessary to calibrate the bituminous distributor. The testing personnel shall meet the requirements specified in ASTM D 3666. Calibration shall be made with the approved job material and prior to applying the tack coat material to the prepared surface. Calibration of the bituminous distributor shall be in accordance with ASTM D 2995.

3.7.3 Sampling and Testing During Construction

Quality control sampling and testing shall be performed as required in paragraph FIELD QUALITY CONTROL.

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SECTION 02559

BITUMINOUS PRIME COAT

PART 1 GENERAL

1.1 SUMMARY (Not Applicable)

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 140	(1988; R1993) Sampling Bituminous Materials
ASTM D 2027	(1976; R 1986) Cutback Asphalt (Medium-Curing Type)
ASTM D 2995	(1984; R 1989) Determining Application Rate of Bituminous Distributors
ASTM D 3666	(1993) Minimum Requirement for Agencies Testing and Inspecting Bituminous Paving Materials

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300SUBMITTAL DESCRIPTIONS:

SD-09 Reports

Field Quality Control; FIO. Sampling and Testing; FIO.

Copies of test results, within 24 hours of completion of tests. Sampling and testing shall be performed by an approved commercial testing laboratory or by facilities furnished by the Contractor.

SD-18 Records

Waybills and Delivery Tickets; FIO.

Waybills and delivery tickets, during progress of the work.

1.4 PLANT, EQUIPMENT, MACHINES AND TOOLS

1.4.1 General Requirements

All plant, equipment, machines and tools used in the work shall be subject to approval and shall be maintained in a satisfactory working condition at

all times. The equipment shall be adequate and shall have the capability of producing the results specified.

1.4.2 Bituminous Distributor

The distributor shall have pneumatic tires of such size and number to prevent rutting, shoving, or otherwise damaging the base surface or other layers in the pavement structure. It shall be designed and equipped to spray the bituminous material in a uniform double or triple lap at the specified temperature, at readily determined and controlled rates with an allowable variation from the specified rate of not more than plus or minus 5 percent, and at variable widths. Distributor equipment shall include a separate power unit for the bitumen pump, full-circulation spray bars, tachometer, pressure gauges, volume-measuring devices, adequate heaters for heating of materials to the proper application temperature, a thermometer for reading the temperature of tank contents, and a hand hose attachment suitable for applying bituminous material manually to areas inaccessible to the distributor. The distributor shall be equipped to circulate and agitate the bituminous material during the heating process.

1.4.3 Power Brooms and Power Blowers

Power brooms and power blowers shall be suitable for cleaning the surfaces to which the prime coat is to be applied.

1.4.4 Storage Tanks

Tanks shall be capable of heating the bituminous material, under effective and positive control at all times, to the required temperature. Heating shall be accomplished by steam coils, hot oil, or electricity. An armored thermometer shall be affixed to the tank so that the temperature of the bituminous material may be read at all times.

1.5 WEATHER LIMITATIONS

The prime coat shall be applied only when the subgrade, subbase, or base course is dry enough to promote uniform coverage and the desired penetration into the treated surface. The prime coat shall be applied only when the atmospheric temperature in the shade is 10 degrees C or above and when the temperature has not been below 1.7 degrees C for the 12 hours prior to the application.

PART 2 PRODUCTS

2.1 BITUMINOUS MATERIAL

Cutback asphalt shall conform to ASTM D 2027, Grade MC-70.

PART 3 EXECUTION

3.1 PREPARATION OF SURFACE

Prior to applying the prime coat, all loose material, dirt, clay, or other objectionable material shall be removed from the surface to be treated. When water based emulsions are to be used, the aggregate base surface shall be lightly scarified to a depth of 12 mm. After coating, the surface shall be re-rolled with a steel wheeled roller to provide a smooth sealed surface. To assure a uniform spread of the bituminous material, the portion of the subgrade, subbase, or base course prepared for treatment, if

excessively dry, shall be lightly sprinkled with water immediately before the application, as directed.

3.2 PRIME COATING

3.2.1 Application Rate

Bituminous material for the prime coat shall be applied in quantities of not less than 0.6 liter nor more than 1.5 liter per square meter of pavement surface. The exact quantities within the range specified, which may be varied to suit field conditions, will be determined by the Contracting Officer.

3.2.2 Application Temperature

Cutback asphalt application temperature shall provide an application viscosity between 10 and 60 seconds, Saybolt Furol, or between 20 and 120 centistokes, kinematic. The temperature viscosity relation shall be furnished to the Contracting Officer. Application temperature shall be within the following ranges as directed:

MC-70 _____ 74-132 degrees C

3.2.3 Application

Following preparation and subsequent inspection of the surface, the prime coat shall be applied at the specified rate with uniform distribution over the surface to be treated. To obtain uniform application of the prime coat on the surface treated at the junction of previous and subsequent applications, building paper shall be spread on the surface for a sufficient distance back from the ends of each application so that the prime coat may be started and stopped on the paper. Immediately after application, the building paper shall be removed and destroyed. All areas and spots missed by the distributor shall be properly treated with the hand spray. Following application of the prime material, the surface shall be allowed to cure without being disturbed for a period of at least 48 hours or longer, as may be necessary to attain penetration into the treated course and evaporation of the volatiles from prime material. As directed, sand shall be spread to effectively blot up and cure any excess bituminous material. Until the succeeding layer of pavement is placed, the primed surface shall be maintained by protecting the surface against damage and by repairing and repriming deficient areas at no additional cost to the Government. No smoking, fire, or flames other than the heaters that are a part of the equipment shall be permitted within 8 meters of heating, distributing, or transferring operation for bituminous materials other than emulsions. Protective creams shall not be used as a substitute for cover clothing.

3.3 FIELD QUALITY CONTROL

Samples of the bituminous material used will be obtained by the Contractor as directed, under the supervision of the Contracting Officer. The sample will be retained and tested by the Government at no cost to the Contractor.

3.4 SAMPLING AND TESTING

3.4.1 General Requirements

No work requiring testing will be permitted until the facilities have been

inspected and approved. The testing laboratory and all field and laboratory testing personnel shall meet the requirements specified in ASTM D 3666. The first test will be at the expense of the Government. Costs incurred for subsequent inspections will be charged to the Contractor.

3.4.2 Sampling

The samples of bituminous material, unless otherwise specified, shall be taken in accordance with ASTM D 140.

3.4.3 Initial Sampling and Testing

3.4.3.1 Bituminous Materials

Sources from which bituminous materials are to be obtained shall be selected and notification thereof furnished the Contracting Officer within 15 days after the award of the contract. Certified copies of the manufacturer's test reports indicating compliance with applicable specified requirements shall be submitted to the Contracting Officer not less than 30 days before the material is required in the work.

3.4.3.2 Calibration Test

The Contractor shall furnish all equipment, materials, and labor necessary to calibrate the bituminous distributor. Calibration shall be made with the approved job material and prior to applying the prime coat material to the prepared surface. Calibration of the bituminous distributor shall be in accordance with ASTM D 2995.

3.4.3.3 Trial Applications

As a preliminary to providing the complete prime coat, three lengths of at least 30 meters for the full width of the distributor bar shall be primed to evaluate the amount of prime that can be satisfactorily applied. Unless otherwise authorized, the trial application rate of bituminous materials shall be applied in the amount of 1 liter per square meter. Other trial applications shall be made using various amounts of material as may be deemed necessary.

3.4.4 Sampling and Testing During Construction

Quality control sampling and testing shall be performed as required in paragraph FIELD QUALITY CONTROL.

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SECTION 02580A

PAVEMENT MARKINGS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
(AASHTO)

AASHTO M 247 (1981; Rev 1986) Glass Beads Used in Traffic Paint

AASHTO M 248 (1991I) Ready-Mixed White and Yellow Traffic Paints

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 792 (1991) Density and Specific Gravity (Relative Density) of Plastics by Displacement

ASTM D 4280 (1995) Extended Life Type, Nonplowable, Prismatic, Raised, Retroreflective Pavement Markers

ASTM D 4505 (1992) Preformed Plastic Pavement Marking Tape for Extended Service Life

ASTM E 28 (1992) Softening Point by Ring-and-Ball Apparatus

FEDERAL SPECIFICATIONS (FS)

FS TT-B-1325 (Rev C) Beads (Glass Spheres) Retro-Reflective (Metric)

FS TT-P-1952 (Rev D) Paint, Traffic and Airfield Marking, Waterborne (Metric)

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL PROCEDURES:

SD-13 Certificates

Volatile Organic Compound (VOC) Content; FIO.

Certificate stating that the proposed pavement marking paint meets the VOC regulations of the local Air Pollution Control District having jurisdiction over the geographical area in which the project is located.

1.3 DELIVERY AND STORAGE

All materials shall be delivered and stored in sealed containers that plainly show the designated name, formula or specification number, batch number, color, date of manufacture, manufacturer's name, and directions, all of which shall be plainly legible at time of use.

1.4 EQUIPMENT

All machines, tools and equipment used in the performance of the work shall be approved and maintained in satisfactory operating condition. Equipment operating on roads and runways will display low speed traffic markings and traffic warning lights.

PART 2 PRODUCTS

2.1 PAINT

Paint for roads and streets shall conform to AASHTO M 248, color as indicated. Pavement marking paints shall comply with applicable state and local laws enacted to ensure compliance with Federal Clean Air Standards. Paint materials shall conform to the restrictions of the local Air Pollution Control District.

2.2 REFLECTIVE MEDIA

Reflective media for roads and streets shall conform to FS TT-B-1325, Type I, Gradation A, or AASHTO M 247, Type I.

PART 3 EXECUTION

3.1 SURFACE PREPARATION

Surfaces to be marked shall be prepared in accordance with manufacturer's recommendations. Rubber deposits, surface laitance, existing paint markings, and other coatings adhering to the pavement shall be completely removed.

3.2 APPLICATION

3.2.1 General

All pavement markings and patterns shall be placed as shown and as recommended by the manufacturer. The Contractor shall provide guide lines and templates as necessary to control paint application. Special precautions shall be taken in marking numbers, letters, and symbols. Edges of markings shall be sharply outlined.

3.2.2 New Surfaces

New pavement surfaces shall be allowed to cure for a period of not less than 30 days before applications of paint.

3.2.3 Rate of Application

Reflective Markings: Pigmented binder shall be applied evenly to the pavement area to be coated at a rate of 10 plus or minus 0.5 square meters per liter. Glass spheres shall be applied uniformly to the wet paint on road and street pavement at a rate of 6 plus or minus 0.06 kg of glass spheres per liter of paint.

Nonreflective Markings: Paint shall be applied evenly to the pavement surface to be coated at a rate of 10 plus or minus 0.5 square meters per liter.

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SECTION 02592

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SECTION 02592

FIELD MOLDED SEALANTS FOR SEALING JOINTS IN RIGID PAVEMENTS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in this text by the basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 509	(1994) Elastomeric Cellular Preformed Gasket and Sealing Material
ASTM D 789	(1994) Determination of Relative Viscosity, Melting Point, and Moisture Content of Polyamide (PA)

FEDERAL SPECIFICATIONS (FS)

FS SS-S-1401	(Rev C; Am 2; Notice 1) Sealant, Joint, Non-Jet-Fuel-Resistant, Hot-Applied, for Portland Cement and Asphalt Concrete Pavements
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1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL PROCEDURES:

SD-06 Instructions

Manufacturer's Recommendations; FIO.

Where installation procedures, or any part thereof, are required to be in accordance with the manufacturer's recommendations, printed copies of these recommendations, 60 days prior to use on the project. Installation of the material will not be allowed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the material.

SD-07 Schedules

Construction Equipment List; FIO.

List of proposed equipment to be used in performance of construction work including descriptive data, 60 days prior to use on the project.

SD-14 Samples

Materials; GA.

Samples of the materials (sealant, primer if required, and backup material), in sufficient quantity for testing and approval 60 days prior to the beginning of work. No material will be allowed to be used until it has been approved.

1.3 SAFETY

Joint sealant shall not be placed within 8 meters of any liquid oxygen (LOX) equipment, LOX storage, or LOX piping. Joints in this area shall be thoroughly cleaned and left unsealed.

1.4 TEST REQUIREMENTS

The joint sealant and backup or separating material shall be tested for conformance with the referenced applicable material specification. The Contracting Officer shall be notified in writing of the proposed sources of joint sealant at least 60 days prior to the date the materials will be required at the project site. Testing of the materials shall be performed in an approved independent laboratory and certified copies of the test reports shall be submitted and approved. If the use of a primer is recommended for the proposed sealing system, the laboratory test for bond shall be conducted using the primer in accordance with the manufacture's recommendations. The Contractor shall furnish samples of materials, in sufficient quantity to be tested, upon request. Conformance with the requirements of the laboratory tests specified will not constitute final acceptance of the materials. Final acceptance will be based on the performance of the in-place materials.

1.5 EQUIPMENT

Machines, tools, and equipment used in the performance of the work required by this section shall be approved before the work is started and shall be maintained in satisfactory condition at all times.

1.5.1 Joint Cleaning Equipment

1.5.1.1 Tractor-Mounted Routing Tool

The routing tool used for removing old sealant from the joints shall be of such shape and dimensions and so mounted on the tractor that it will not damage the sides of the joints. The tool shall be designed so that it can be adjusted to remove the old material to varying depths as required. The use of V-shaped tools or rotary impact routing devices will not be permitted. Hand-operated spindle routing devices may be used to clean and enlarge random cracks.

1.5.1.2 Concrete Saw

A self-propelled power saw with water-cooled diamond or abrasive saw blades will be provided for cutting joints to the depths and widths specified or for refacing joints or cleaning sawed joints where sandblasting does not provide a clean joint.

1.5.1.3 Sandblasting Equipment

Sandblasting equipment shall include an air compressor, hose, and long-wearing venturi-type nozzle of proper size, shape and opening. The

maximum nozzle opening should not exceed 6.4 mm (1/4 inch). The air compressor shall be portable and shall be capable of furnishing not less than 71 liters per second (150 cubic feet per minute) and maintaining a line pressure of not less than 621 kPa (90 psi) at the nozzle while in use. Compressor capability under job conditions must be demonstrated before approval. The compressor shall be equipped with traps that will maintain the compressed air free of oil and water. The nozzle shall have an adjustable guide that will hold the nozzle aligned with the joint approximately 1 inch above the pavement surface. The height, angle of inclination and the size of the nozzle shall be adjusted as necessary to secure satisfactory results.

1.5.1.4 Hand Tools

Hand tools may be used, when approved, for removing defective sealant from a crack and repairing or cleaning the crack faces.

1.5.2 Sealing Equipment

1.5.2.1 Hot-Poured Sealing Equipment

The unit applicators used for heating and installing FS SS-S-1401 joint sealant materials shall be mobile and shall be equipped with a double-boiler, agitator-type kettle with an oil medium in the outer space for heat transfer; a direct-connected pressure-type extruding device with a nozzle shaped for inserting in the joint to be filled; positive temperature devices for controlling the temperature of the transfer oil and sealant; and a recording type thermometer for indicating the temperature of the sealant. The applicator unit shall be designed so that the sealant will circulate through the delivery hose and return to the inner kettle when not in use.

1.6 DELIVERY AND STORAGE

Materials delivered to the job site shall be inspected for defects, unloaded, and stored with a minimum of handling to avoid damage. Storage facilities shall be provided by the Contractor at the job site for maintaining materials at the temperatures and conditions recommended by the manufacturer.

1.7 ENVIRONMENTAL CONDITIONS

The ambient air temperature and the pavement temperature within the joint wall shall be a minimum of 10 degrees C and rising at the time of application of the materials. Sealant shall not be applied if moisture is observed in the joint.

PART 2 PRODUCTS

2.1 SEALANTS

Sealants shall conform to the following requirement:

Type II Sealant: FS SS-S-1401

2.2 PRIMERS

The use of primers when recommended by the manufacturer of the proposed sealant is authorized in accordance with the manufacturer's instructions.

2.3 BACKUP MATERIALS

The backup material shall be a compressible, nonshrinking, nonstaining, nonabsorbing material and shall be nonreactive with the joint sealant. The material shall have a melting point at least 3 degrees C greater than the pouring temperature of the sealant being used when tested in accordance with ASTM D 789. The material shall have a water absorption of not more than 5 percent of the sample weight when tested in accordance with ASTM C 509. The backup material shall be 25 plus or minus 5 percent larger in diameter than the nominal width of the crack.

2.4 BOND BREAKING TAPES

The bond breaking tape or separating material shall be a flexible, nonshrinkable, nonabsorbing, nonstaining, and nonreacting adhesive-backed tape. The material shall have a melting point at least 3 degrees C greater than the pouring temperature of the sealant being used when tested in accordance with ASTM D 789. The bond breaker tape shall be approximately 3 mm wider than the nominal width of the joint and shall not bond to the joint sealant.

PART 3 EXECUTION

3.1 PREPARATION OF JOINTS

Immediately before the installation of the sealant, the joints shall be thoroughly cleaned to remove all laitance, curing compound, filler, protrusions of hardened concrete, and old sealant from the sides and upper edges of the joint space to be sealed.

3.1.1 Sawing

3.1.1.1 Refacing of Joints

Refacing of joints shall be accomplished using a concrete saw as specified in paragraph EQUIPMENT to saw through sawed and filler-type joints to loosen and remove material until the joint is clean and open to the full specified width and depth. The blade shall be stiffened with a sufficient number of suitable dummy (or used) blades or washers. Immediately following the sawing operation, the joint opening shall be thoroughly cleaned using a water jet to remove all saw cuttings and debris.

3.1.1.2 Refacing of Random Cracks

Sawing of the cracks shall be accomplished using a power-driven concrete saw as specified in paragraph EQUIPMENT. The saw blade shall be 152 mm (6 inch) or less in diameter to enable the saw to follow the trace of the crack. The blade shall be stiffened as necessary with suitable dummy (or used) blades or washers. Immediately following the sawing operation, the crack opening shall be thoroughly cleaned using a water jet to remove all saw cuttings and debris.

3.1.2 Sandblasting

The newly exposed concrete joint faces and the pavement surfaces extending a minimum of 13 mm from the joint edges shall be sandblasted clean. A multiple-pass technique shall be used until the surfaces are free of dust,

dirt, curing compound, filler, old sealant residue, or any foreign debris that might prevent the bonding of the sealant to the concrete. After final cleaning and immediately prior to sealing, the joints shall be blown out with compressed air and left completely free of debris and water.

3.1.3 Back-Up Material

When the joint opening is of a greater depth than indicated for the sealant depth, the lower portion of the joint opening shall be plugged or sealed off using a back-up material to prevent the entrance of the sealant below the specified depth. Care shall be taken to ensure that the backup material is placed at the specified depth and is not stretched or twisted during installation.

3.1.4 Bond Breaking Tape

Where inserts or filler materials contain bitumen, or the depth of the joint opening does not allow for the use of a backup material, a bond breaker separating tape will be inserted to prevent incompatibility with the filler materials and three-sided adhesion of the sealant. The tape shall be securely bonded to the bottom of the joint opening so it will not float up into the new sealant.

3.1.5 Rate of Progress of Joint Preparation

The stages of joint preparation which include sandblasting, air pressure cleaning and placing of the back-up material shall be limited to only that lineal footage that can be sealed during the same day.

3.2 PREPARATION OF SEALANT

3.2.1 Hot-Poured Sealants

Sealants conforming to FS SS-S-1401 shall not be heated in excess of the safe heating temperature recommended by the manufacturer as shown on the sealant containers. Sealant that has been overheated or subjected to application temperatures for over 4 hours or that has remained in the applicator at the end of the day's operation shall be withdrawn and wasted.

3.3 INSTALLATION OF SEALANT

3.3.1 Time of Application

Joints shall be sealed immediately following final cleaning of the joint walls and following the placement of the separating or backup material. Open joints that cannot be sealed under the conditions specified, or when rain interrupts sealing operations shall be recleaned and allowed to dry prior to installing the sealant.

3.3.2 Sealing Joints

Immediately preceding, but not more than 15 m ahead of the joint sealing operations, a final cleaning with compressed air shall be performed. The joints shall be filled from the bottom up to 3 mm plus or minus 1.5 mm below the pavement surface. Excess or spilled sealant shall be removed from the pavement by approved methods and shall be discarded. The sealant shall be installed in such a manner as to prevent the formation of voids and entrapped air. Traffic shall not be permitted over newly sealed pavement until authorized by the Contracting Officer. When a primer is

recommended by the manufacturer, it shall be applied evenly to the joint faces in accordance with the manufacturer's instructions. Joints shall be checked frequently to ensure that the newly installed sealant is cured to a tack-free condition within the time specified.

3.4 INSPECTION

3.4.1 Joint Cleaning

Joints shall be inspected during the cleaning process to correct improper equipment and cleaning techniques that damage the concrete pavement in any manner. Cleaned joints shall be approved prior to installation of the separating or back-up material and joint sealant.

3.4.2 Joint Sealant Application Equipment

The application equipment shall be inspected to ensure conformance to temperature requirements, proper proportioning and mixing (if two-component sealant) and proper installation. Evidences of bubbling, improper installation, failure to cure or set shall be cause to suspend operations until causes of the deficiencies are determined and corrected.

3.4.3 Joint Sealant

The joint sealant shall be inspected for proper rate of cure and set, bonding to the joint walls, cohesive separation within the sealant, reversion to liquid, entrapped air and voids. Sealants exhibiting any of these deficiencies at any time prior to the final acceptance of the project shall be removed from the joint, wasted, and replaced as specified herein at no additional cost to the Government.

3.5 CLEAN-UP

Upon completion of the project, all unused materials shall be removed from the site and the pavement shall be left in a clean condition.

3.6 CONSTRUCTION QUALITY CONTROL

Attention is directed to SECTION: CONSTRUCTION QUALITY CONTROL which requires the Contractor to perform quality control inspection, testing, and reporting.

-- End of Section --

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SECTION 02611

CONCRETE PAVEMENT FOR PADS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN CONCRETE INSTITUTE (ACI)

ACI 211.1	(1991) Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete
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AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 184	(1990) Fabricated Deformed Steel Bar Mats for Concrete Reinforcement
ASTM A 615	(1995b) Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM A 675	(1990) Steel Bars, Carbon, Hot-Wrought, Special Quality Mechanical Properties.
ASTM C 31	(1991) Making and Curing Concrete Test Specimens in the Field
ASTM C 33	(1993) Concrete Aggregates
ASTM C 70	(1985) Surface Moisture in Fine Aggregate.
ASTM C 94	(1994) Ready-Mixed Concrete
ASTM C 117	(1990) Materials Finer than No. 75-um (No. 200) Sieve in Mineral Aggregates by washing.
ASTM C 123	(1992) Lightweight Pieces in Aggregate.
ASTM C 136	(1995a) Sieve Analysis of Fine and Coarse Aggregates
ASTM C 142	(1990) Clay Lumps and Friable Particles in Aggregates.
ASTM C 143	(1990a) Slump of Hydraulic Cement Concrete
ASTM C 150	(1994) Portland Cement
ASTM C 171	(1992) Sheet Materials for Curing Concrete

ASTM C 174	(1991) Measuring Length of Drilled Concrete Cores.
ASTM C 192	(1990a) Making and Curing Concrete Test Specimens in the Laboratory
ASTM C 231	(1991b) Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C 260	(1994) Air-Entraining Admixtures for Concrete
ASTM C 295	(1990) Petrographic Examination of Aggregates for Concrete.
ASTM C 494	(1992) Chemical Admixtures for Concrete
ASTM C 566	(1989) Total Moisture Content of Aggregate by Drying.
ASTM C 595	(1994a) Blended Hydraulic Cements
ASTM C 618	(1994) Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete
ASTM C 881	(1990) Epoxy-Resin-Base Bonding Systems for Concrete
ASTM D 1751	(1983; R 1991) Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
ASTM D 1752	(1984; R 1992) Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction
ASTM D 2828	(1971; R 1981) Nonbituminous Inserts for Contraction Joints in Portland Cement Concrete Airfield Pavements, Sewable Type.

U.S. ARMY CORPS OF ENGINEERS HANDBOOK FOR CEMENT AND CONCRETE (CRD)

CRD-C 130	(1977) Scratch Hardness of Coarse Aggregate Particles.
CRD-C 300	(1977) Membrane-Forming Compounds for Curing Concrete.

U.S. DEPARTMENT OF COMMERCE, NATIONAL BUREAU OF STANDARDS (NBS),
HANDBOOKS:

H44	Specifications, Tolerances, and Other Technical Requirements for Commercial Weighing and Measuring Devices (Fourth Edition 1971 with Replacement Sheets 1977).
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1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL DESCRIPTIONS:

Proportions of Mix; GA.

The results of trial mix along with a statement giving the maximum nominal coarse aggregate size and the proportions of all ingredients that will be used in the manufacture of each strength of concrete, at least 30 days prior to commencing concrete placing operations. Mix proportioning shall be the responsibility of the Contractor. Aggregate weights shall be based on the saturated surface dry condition. The statement shall be accompanied by test results from an independent commercial testing laboratory, attesting that the proportions selected will produce concrete of the qualities indicated. No substitutions shall be made in the materials used in the work without additional tests to show that the quality of the concrete is satisfactory.

Plant and Equipment; FIO.

Submittals for approval on plant, equipment, and construction methods shall be made no later than 60 days prior to initial placement. The Contracting Officer shall be given access at all times to all parts of the plant and equipment for checking adequacy of the equipment in use; operation of the plant, verifying weights, proportions, temperature, mixing time, and character of the materials.

SD-09 Reports

Sampling and Testing; FIO.

Certified copies of laboratory test reports, including all test data, for admixtures, expansion joint filler, contraction joint inserts and curing compounds. These tests shall be made by an approved commercial laboratory or by a laboratory maintained by the manufacturers of the materials.

SD-13 Certificates

Cementitious Materials; FIO.

Manufacturer's certification of compliance, accompanied by mill test reports attesting that the materials meet the requirements of the specification under which it is furnished for cement or pozzolan. No cement or pozzolan shall be used until notice of acceptance has been given. Cement or pozzolan may be subjected to check testing by the Government from samples obtained at the mill, at transfer points, or at the project site.

1.3 GENERAL REQUIREMENTS

1.3.1 Composition

Concrete shall be composed of cementitious material, fine aggregate, coarse aggregate, water, an air entraining admixture, and at the option of the contractor, other admixtures.

1.3.2 Strength and Air Content

The proportioning of the mix, which shall be based on ACI 211.1, shall use materials approved by the Contracting Officer and in conformance with these specifications, shall be the responsibility of the Contractor. The Contractor shall design the mix to achieve a compressive strength of 28 Mpa at 28 days. Compressive strength shall be determined from laboratory cylinders in accordance with ASTM C 192. Seven day strengths are taken for the purpose of determining early strength of the concrete for construction loading and are not to be considered in evaluating the 28 day strength of the concrete. The air content of the concrete shall be maintained at 6 percent plus or minus 1 percent. The Contracting Officer shall be notified prior to any changes to the proportions of the mix.

1.3.3 Production, Sampling and Testing of Aggregates

For each shift of concrete paving operation, the Contractor shall perform grading, fineness modulus, moisture content, particle shape tests and certain tests for suspect deleterious substances to determine conformance with the specification requirements. Grading, fineness modulus, moisture content, and particle shape tests shall be performed in accordance with PARAGRAPH: CONTRACTOR QUALITY CONTROL. Tests for suspect deleterious substances shall be performed on aggregate samples taken from the aggregate plant. During the first part of the paving operation, sampling and testing for these tests should be once every shift of concrete placement. When the test data from four consecutive tests for each type of testing show only test results which comply with the provisions in these specifications, the frequency of the testing, on approval of the Contracting Officer, may be reduced.

1.4 DELIVERY AND STORAGE OF MATERIALS

1.4.1 Cement and Pozzolan

Cementitious materials shall be dry and free from lumps and caking when delivered. Immediately upon receipt at the site of the work, cementitious materials shall be stored in a dry, weathertight, and properly ventilated structure.

1.4.2 Aggregates

Each size of aggregate shall be stored separately in free-draining stockpiles and shall be handled and stored in such manner as to avoid breakage, segregation, or contamination by foreign materials.

1.5 GRADE CONTROL

The lines and grades shown for each pavement category of the contract shall be established and maintained by means of line and grade stakes placed at the jobsite by the Contractor in accordance with the SPECIAL PROVISIONS. Elevations of all bench marks used by the Contractor for controlling pavement operations at the jobsite and for finished pavement grade lines and elevations will be established and maintained by the Government.

1.6 PROPORTIONING

1.6.1 Mixture Proportions

The proportions of all material entering into the concrete mixtures shall be as determined in Paragraph: STRENGTH AND AIR CONTENT. The proportions will be changed only when necessary to maintain the workability, strength, and standard of quality required for the concrete covered by these specifications, and to meet the varying conditions encountered during the construction. Changes shall be the responsibility of the Contractor, and the Contracting Officer shall be notified in writing. The use of pozzolan is mandatory at a volume of 20 to 30 percent of the total cementitious material used in the mix.

1.6.1.1 Average Strength

In meeting the strength requirements specified, the selected mixture proportion shall produce an average compressive strength exceeding the specified strength by the amount indicated below. Where a concrete production facility has test records, a standard deviation shall be established. Test records from which a standard deviation is calculated shall represent materials, quality control procedures, and conditions similar to those expected; shall represent concrete produced to meet a specified strength or strengths within 7 Mpa of that specified for proposed work; and shall consist of at least 30 consecutive tests. A strength test shall be the average of the strengths of two cylinders made from the same sample of concrete and tested at 28 days or at other test age designated for determination of the specified strength.

1.6.1.2 Test Records Exceeding 29

Required average compressive strength used as the basis for selection of concrete proportions shall be the larger of the specified strength plus the standard deviation multiplied by 1.34 or the specified strength plus the standard deviation multiplied by 2.33 minus 500.

1.6.1.3 Test Records Less Than 29

Where a concrete production facility does not have test records meeting the above requirements but does have a record based on 15 to 29 consecutive tests, a standard deviation may be established as the product of the calculated standard deviation and a modification factor from the following table:

No. of tests (1)	Modification factor for standard deviation
less than 15	See Note
15	1.16
20	1.08
25	1.03
30 or more	1.00

(1) Interpolate for intermediate numbers of tests.

When a concrete production facility does not have field strength test records for calculation of standard deviation or the number of tests is less than 15, the required average strength shall be:

- a. The specified strength plus 7 specified strength of less than 21

MPa.

- b. The specified strength plus 8 for specified strengths of 21 to 35 MPa.

1.6.2 Measurement

All aggregates and cementitious materials shall be measured by weight. Mixing water and air-entraining admixtures may be measured by volume or by weight.

1.6.3 Workability

The water content of the concrete shall be the minimum necessary to obtain the workability required for the specific conditions and methods of placement. The slump of the concrete shall be maintained at the lowest practical value and shall not exceed 50.8 mm for concrete placement using fixed forms or 25.4 mm for slip-form placement, when tested in accordance with ASTM C 143. Every effort shall be made to insure that the concrete, as it reaches the paver, is as uniform as possible from batch to batch. If wet batches are encountered, they shall be wasted. If the addition of water is necessary to provide the required slump to the mixed concrete, the mixture design water-cement ratio shall not be exceeded.

1.7 EQUIPMENT, APPROVAL AND MAINTENANCE

Dependable and sufficient equipment that is appropriate and adequate to meet the approved plan and schedule for the work specified shall be furnished by the Contractor and assembled at the work site sufficiently early before the start of paving to permit thorough inspection, calibration of weighing and measuring devices, adjustment of parts, and making required repairs. The equipment shall be approved in writing by the Contracting Officer and maintained in good working condition by the Contractor.

PART 2 PRODUCTS

2.1 AGGREGATE

Fine and coarse aggregates shall conform to ASTM C 33 and the requirements herein. Coarse aggregate shall consist of crushed or uncrushed gravel, crushed stone, or a combination thereof. Aggregates as delivered to the mixers shall consist of clean, hard, uncoated particles meeting the requirements of ASTM C 33. Dust and other coating shall be removed from the coarse aggregates by washing. Fine aggregate shall consist of natural and/or manufactured sand, or a combination of the two, and shall be composed of clean, hard, durable particles. Dust and other coating shall be removed from the coarse aggregates by washing.

2.1.1 Size and Grading

The maximum nominal size of the coarse aggregate shall be in accordance to ASTM C 33 Table 2, Size No. 57.

2.1.2 Deleterious Substances

The amount of deleterious substances in each size group shall not exceed the limits shown below, determined in accordance with ASTM C 142, ASTM C 117, ASTM C 123, ASTM C 295 and CRD-C 130 (applicable only to material coarser

than 9.5 mm).

Deleterious Materials

Material	Percentage by Weight	
	Coarse Aggregate(1)	Fine Aggregate (2)
Clay lumps and friable particles	1.0	1.0
Material finer than No. 200 sieve	1.0 (3)	3.0
Lightweight particles	1.0 (4)	0.5
Other soft particles	2.0	

NOTES:

1 The total of all deleterious substances shall not exceed 4.0 percent of the weight of the aggregate. The percentage of material finer than No. 200 sieve shall not be included in this total.

2 The total of all deleterious materials shall not exceed 3.0 percent of the weight of the aggregate. Sand shall be washed if material is found to have material finer than the 200 sieve.

3 Limit for material finer than No. 200 sieve will be increased to 1.5 percent for crushed aggregates consisting of crusher dust that is essentially free from clay or shale.

4 The separation medium shall have specific gravity of 2.0.

2.1.3 Sand

Limit percentage of sand, by total weight of aggregate, to 38% in concrete mix

2.2 ADMIXTURES

Admixtures shall conform to the following:

2.2.1 Air-entraining Admixture

Air-entraining admixture shall be an approved substance or compound conforming to ASTM C 260.

2.2.2 Retarder

A retarding admixture shall meet the requirements of ASTM C 494, Type B, except that the 6-month and 1-year compressive strength tests are waived. The use of the admixture is at the option of the Contractor and may only be used for fixed form placement method. Retarder may not be used for slipform placing method.

2.2.3 Water-Reducer

A water-reducing admixture shall meet the requirements of ASTM C 494, Type A except that the 6-month and 1-year compressive strength tests are waived. The admixture may be added to the concrete mixture only when its use is approved or directed. A type D admixture shall not be used in mixes used for slip-form paving.

2.3 CEMENTITIOUS MATERIALS

2.3.1 Cement

Cement shall be portland cement conforming to ASTM C 150, Type II, Low Alkali Cement. The physical requirements for false set shall apply.

2.3.2 Portland-Pozzolan Cement

Portland-pozzolan cement shall conform to the requirements of ASTM C 595, Type IP, but shall meet the volume requirements noted in the last sentence of paragraph 1.6.1 Mixture Proportioning.

2.3.3 Pozzolan

Pozzolan shall conform to ASTM C 618, Class F. Supplementary physical requirements in Table 1A & 2A shall apply including reactivity with alkalis. Maximum loss on ignition for pozzolan shown in Table 1 of ASTM C 618 shall be 3.0 percent.

2.4 CURING MATERIALS

Curing materials shall conform to the following:

- a. White burlap-polyethylene sheet shall conform to ASTM C 171.
- b. Membrane curing compound shall be a pigmented type conforming to Corps of Engineers Specification CRD-C 300.

2.5 DOWELS

Dowels shall be plain steel bars conforming to ASTM A 675, grade 80, and of the sizes and dimensions indicated.

2.6 JOINT FILLER

2.6.1 For Expansion Joints

Filler shall be preformed materials conforming to ASTM D 1751 or ASTM D 1752.

2.6.2 For Contraction Joints

Sewable type contraction joint inserts shall conform to ASTM D 2828.

2.7 REINFORCEMENT

All reinforcement shall be free from loose flaky rust, loose scale, oil, grease, mud, or other coatings that might reduce and bond with concrete.

2.7.1 Bar mats

Bar mat shall conform to ASTM A 184

2.7.2 Reinforcing bars

Reinforcing bars shall conform to ASTM A 615, grade 40

2.8 WATER

Water for washing aggregate and for mixing and curing concrete shall be

fresh and free from injurious amounts of oil, acid, salt, alkali, organic matter, or other deleterious substances.

2.9 EPOXY RESIN

Epoxy resin shall conform to ASTM C 881.

PART 3 EXECUTION

3.1 SUBGRADE, BASE, FORMS, AND STRINGLINE

3.1.1 Underlying Material

The prepared surface of the subgrade or base course material shall be kept free of foreign matter, waste concrete and/or cement, and debris at all times and shall be thoroughly wetted down sufficiently in advance to insure a firm, moist condition when the concrete is placed. In cold weather the underlying material shall be prepared and so protected that it will be entirely free from frost when the concrete is placed. The use of chemicals to eliminate frost in the underlying material will not be permitted. Crossing of the prepared subgrade at specified intervals for construction purposes may be permitted for any type of subgrade, provided rutting or indentations do not occur. If traffic has been allowed to use the prepared subgrade, the surface shall be checked and corrected before concrete is placed.

3.1.2 Forms

Forms shall be of steel, except that wood forms may be used on curves having a radius of 45 meters or less, and for fillets. Forms shall be equal in depth to the edge thickness of the slab as shown, and shall not be built up except as permitted below. When the project required several different slab thicknesses, forms may be built up with metal or wood to provide an increase in depth of not more than 25 percent.

3.1.2.1 Steel Forms

Steel forms shall be furnished in sections not less than 3 meter in length, except that on curves having a radius of 45 meters or less, the length of the sections shall be five feet unless the sections are flexible or curved to the proper radius. The top surface of a form shall vary not more than 3 mm in 3 meter from a true line. The face of the form shall vary not more than 6 mm in 3 meter from a true plan. Forms with battered top surfaces, warps, bends, kinks, or distorted faces or bases shall be removed from the project.

3.1.2.2 Wood Forms

Wood forms for curves and fillets shall be made of well-seasoned surfaced plank or plywood, straight, and free from warp or bend. Wood forms shall be adequate in strength and rigidly braced.

3.1.3 Form Setting

The forms shall be set on firm material cut true to grade so that each form section when placed will be firmly in contact with the underlying layer for its entire length and base width. The length of pins and quantity provided in each section shall be sufficient to hold the form at the correct line

and grade. When tested by a 3.7-meters straight-edge, the top of the form shall conform to the requirements specified for the finished surface of the concrete. Forms shall be set well in advance of concrete placement. They shall be cleaned and oiled each time before concrete is placed.

3.1.4 Stringline

Stringline shall be accurately and securely installed well in advance of concrete placement. Staked supports shall be placed at intervals to eliminate sag with the stringline is tightened. The stringline shall be high strength wire that will allow sufficient tension to be applied to remove sag between supports. The stringline at the supports shall be easily adjusted in both the horizontal and vertical directions. When necessary to leave gaps in the stringline, supports on either side of the gap shall be secured to avoid disturbing the remainder of the stringline when the portion across the gap is positioned and tightened. Vertical and horizontal positioning of the stringline shall be such that the finished pavement shall conform to the alinement and grade elevations shown.

3.1.5 BATCHING, MIXING AND TRANSPORTATION

3.1.5.1 Type of Plant

The Contractor shall provide semiautomatic or automatic concrete plant conforming to the applicable requirements of ASTM C 94, except as specified below. The concrete plant may be located on or off the Government premises as approved.

3.1.5.1.1 Scales

The Contractor shall provide standard test weights and any other auxiliary equipment required for checking the operating performance of each scale or other measuring device. Periodic tests shall be made when and as directed, in the presence of the Contracting Officer. Upon completion of each check test and before further use of the indicating, or control devices, such adjustments, repairs, or replacements shall be made as required to secure satisfactory performance.

3.2 Protection

Weighing, indicating, recording and control equipment shall be protected against exposure to dust and weather.

3.3 Concrete Mixers

3.3.1 General Requirements

The mixing time will be increased when necessary to secure the required uniformity and consistency of the concrete. Excessive overmixing requiring additions of water will not be permitted. The mixers shall be maintained in satisfactory operating condition, and mixer drums shall be kept free of hardened concrete. Mixer blades shall be replaced when worn down more than 10 percent of their original depth. The use of a mixer that at any time produces unsatisfactory results shall be promptly discontinued until repaired.

3.3.2 Truck Mixers

Truck mixers shall be used for fixed form placement. Transportation of

concrete batched at a batch plant shall be transported to the point of placement by truck agitator or truck mixer. Truck mixers, the mixing of concrete therein, and concrete uniformity, shall conform to the requirements of ASTM C 94. A truck mixer may be used either for complete mixing (transit mixing) or to finish the partial mixing done in a stationary mixer (shrink-mixed). Each truck shall be equipped with two counters from which it will be possible to determine the number of revolutions at mixing speed and the number of revolutions at agitating speed.

3.4 Transportation Equipment

All transporting equipment shall conform to ASTM C 94 except as modified herein. Vehicles and equipment transporting concrete shall be capable of delivering and discharging the concrete without segregation. The transfer and distribution of the concrete from vehicles shall be by mechanical spreader, or concrete bucket and crane.

3.5 PLACING

3.5.1 General

Concrete shall be placed between stationary forms. When concrete is truck mixed or when a truck mixer or a agitator is used for transporting concrete, the concrete shall be deposited between the stationary forms within 1-1/2 hours from the time the cement is introduced to the aggregates. When the length of haul makes it impossible to deliver truck mixed concrete within these time limits, batching of cement and a portion of the mixing water shall be delayed until the truck mixer is at or near the construction site. At no case shall the water cement ratio of the proposed mix be exceeded by the addition of extra mixing water. Concrete shall be deposited as close as possible to its final position in the pavement cross section.

3.5.2 Placing Reinforcing Steel

The type and amount of steel reinforcement shall be as shown on the drawings. For pavement thickness of 305 mm or more, the reinforcement steel shall be installed by the strike-off method wherein the concrete is deposited on the underlying material, consolidated and struck to the indicated elevation of the steel reinforcement. The reinforcement shall be laid upon the prestruck surface, and the remaining concrete shall then be placed and finished in the required manner. Any portions of the bottom layer of concrete that have been placed more than 30 minutes without being covered with the top layer shall be removed and replaced with newly mixed concrete without additional cost to the Government. For pavements less than 305 mm thick, the reinforcement may be positioned on suitable chairs prior to concrete placement.

3.5.3 Placement During Cold Weather

Concrete placement shall be discontinued when the air temperature reaches 4 degrees C and is falling and shall not be resumed until the air temperature reaches 2 degrees C and is rising. Provision shall be made to protect the concrete from freezing during the specified curing period. Concrete damaged by freezing shall be removed and replaced in conformance with Paragraph: REMOVAL AND REPLACEMENT OF DEFECTIVE PAVEMENT AREAS below.

3.5.4 Placing During Warm Weather

During periods of warm weather when the maximum daily air temperature is likely to exceed 29 degrees C, the following precautions shall be taken. The forms shall be sprinkled with water immediately before placing the concrete. The concrete temperature shall not exceed 32 degrees C when placed. The aggregates and/or mixing water shall be cooled as necessary.

3.6 FIELD TEST SPECIMENS

3.6.1 General

Concrete samples shall be furnished by the Contractor, and shall be taken in the field by the Contractor at his expense to determine the slump, air content, and strength of the concrete. Cylinders will be made for determining conformance with the strength requirements of these specifications and, when required, for determining the time at which pavements may be placed in service. The air content will be determined in conformance with ASTM C 231. Test cylinders shall be molded and cured in conformance with ASTM C 31. The Contractor shall furnish all materials, labor and facilities required for molding, curing, and protecting test cylinders at the site and under the supervision of the Contracting Officer.

3.6.2 Specimens for Strength Tests

Compressive strength cylinders shall be made each shift that concrete is placed. Each group of cylinders shall be molded from the same batch of concrete, and shall consist of a sufficient number of specimens to provide two tests at each test age. One group of specimens shall be made during each shift. However, at the start of paving operations and when the aggregate source, aggregate characteristics, or mix design is changed, additional groups of test cylinders may be required until the Contracting Officer is satisfied that the concrete mixture being used complies with the strength requirements of these specifications. Test ages shall be 7 days and 28 days.

3.7 FINISHING

Finishing operations shall be started immediately after concrete placement. Finishing shall be by the machine method except that where so indicated, the hand method will be permitted on odd slab widths or shapes and in event of breakdown of the mechanical equipment to finish concrete. The sequence of operations shall be as follows: screeding, consolidation, floating, straight edging, and texturing.

3.7.1 Machine Finishing - Fixed Forms

3.7.1.1 Equipment

The finishing machine shall be operated to strike-off screed, and consolidate the concrete. Machines that cause displacement of side forms or that cause frequent delays due to mechanical failure shall be replaced. Finishing machines riding the edge of a previously constructed slab shall be made to protect the surface to these slabs.

3.7.1.2 Finishing

The finishing machine shall make as many trips over each area of pavement as necessary to compact the concrete and produce a surface of uniform texture, true to grade. However, excessive manipulation that brings to the

surface an excess of mortar and water will not be permitted, and any equipment that cannot produce the required compaction and surface finish without an excessive number of trips will be considered unsatisfactory. The top of the form or pavement edge upon which the finishing machine travels shall be kept clean.

3.7.1.3 Mechanical Floating

After completion of finishing, the mechanical float shall be operated to smooth and finish the pavement to grade. If required, additional concrete shall be placed and screeded, and the float operated over the same area until a satisfactory surface is produced.

3.7.1.4 Other Types of Finishing Equipment

Concrete finishing equipment of types other than specified above may be used on a trial basis. The use of equipment that fails to produce finished concrete of the quality and consistency required by these specifications shall be discontinued, and the concrete shall be finished with approved equipment and in the manner specified above.

3.7.2 Hand Finishing

3.7.2.1 Equipment

Vibrators, a strike template, and a longitudinal float shall be provided for hand finishing. The template shall be at least 305 mm longer than the width of pavement being finished and shall be of an approved design, sufficiently rigid to retain its shape, and constructed of metal or other suitable material shod with metal. The longitudinal float shall be at least 3 meters long, of approved design, rigid and substantially braced and shall maintain a plane surface on the bottom of the base.

3.7.2.2 Finishing and Floating

After vibration, the concrete shall be struck off and screeded to the crown, cross section, and elevation required. If necessary, additional concrete shall be placed and screeded, and the float operated until a satisfactory surface has been produced.

3.7.3 Surface Correction and Testing

After transverse finishing is completed but while the concrete is still plastic, the surface shall then be tested for trueness with a 3.7 meters straightedge held in successive positions parallel and at right angles to the centerline of the pavement, and the whole area covered as necessary to detect variations. The straightedge shall be advanced along the pavement in successive stages. Depressions shall be immediately filled with freshly mixed concrete, struck off, consolidated, and refinished. Projections above the required elevation shall also be struck off and refinished. The straightedge testing and finishing shall continue until the entire surface of the concrete is free from observable departure from the straightedge and conform to the surface requirements specified under subparagraph: "Surface Smoothness" below.

3.7.4 Texturing

Before the surface sheen has disappeared and before the concrete becomes nonplastic, the surface of the pavement shall be given the texture as

described below.

3.7.4.1 Burlap-Drag Texture

Surface texture shall be applied by dragging the surface of the pavement, in the direction of the concrete placement, with an approved multiple-ply burlap drag at least 0.9 meter in width and equal in length to the width of the slab. The leading transverse edge of the drag shall be securely fastened to a lightweight pole or traveling bridge, and at least 305 mm of the burlap shall be in contact with the pavement during dragging operation.

The drag shall be operated with the burlap moist and the burlap shall be cleaned and changed as required. The dragging shall be done so as to produce a uniform finished surface having a fine sandy texture without disfiguring marks.

3.7.5 Edging

After texturing has been completed, the edge of slabs along the forms, where indicated or directed, shall be carefully finished with an edging tool to form a smooth surface of the required radius. Tool marks shall be eliminated, and the edges shall be smooth and true to line. No edging shall be performed on the edges of slipformed lanes.

3.7.6 Outlets in Pavement

Recesses for the tie down anchors and other outlets in the pavement shall be constructed to conform to the details and dimensions shown. The concrete in these areas shall be carefully finished to provide a surface of the same texture as the surrounding area that will be within the requirements of PLAN GRADE AND SURFACE-SMOOTHNESS REQUIREMENTS below.

3.8 CURING

3.8.1 General

Concrete shall be protected against loss of moisture and rapid temperature changes for at least seven days from the beginning of the curing operation.

Unhardened concrete shall be protected from rain and flowing water. All equipment needed for adequate curing and protection of the concrete shall be on hand and ready to install before actual concrete placement begins. If any selected method of curing does not afford the proper curing and protection against concrete cracking, the damaged pavement will be removed and replaced and another method of curing shall be employed as directed.

3.8.2 Curing Procedures

Concrete curing shall be continued for the duration of the required curing period by the following method.

3.8.2.1 White Burlap-polyethylene Sheet

White burlap-polyethylene covers shall be at least 305 mm longer than necessary to cover the entire width and edge of the pavement lane. Adjacent mats shall overlap at least 152 mm. The mats shall be thoroughly wetted before placing and shall be kept continuously wet and in intimate contact with the pavement edges and surface for the duration of the required curing period.

3.8.2.2 Membrane Curing

A uniform coating of white pigmented membrane curing compound shall be applied to the entire exposed surface of the concrete as soon after finishing as free water has disappeared from the finished surface. Formed surfaces shall be coated immediately after the forms are removed and in no case longer than one hour after removal of forms. The concrete shall not be allowed to dry before the application of the membrane. If any drying has occurred, the surface of the concrete shall be moistened with a fine spray of water, and the curing compound applied as soon as the free water disappears. The curing compound shall be applied to the finished surfaces by means of an approved multiple nozzle automatic spraying machine. The curing compound in the drum used for the spraying operation shall be thoroughly and continuously agitated mechanically throughout the full depth of the drum during the application. The curing compound shall be applied with a coverage rate of not more than 4.9 meters square per liter. The application of curing compound by hand-operated pressure sprayers will be permitted only on odd widths or shapes of slabs where indicated, and on concrete surfaces exposed by the removal of forms. Concrete surfaces that are subjected to heavy rainfall within three hours after the curing compound has been applied shall be resprayed by the method and at the coverage specified above. Areas where the curing compound is damaged by subsequent construction operations within the curing period shall be resprayed.

3.9 FORM REMOVAL

Forms shall remain in place at least 12 hours after the concrete has been placed. When conditions are such that the early-strength gain of the concrete is delayed, the forms shall be left in place for a longer period as directed. Forms shall be removed without injuring the concrete. Any concrete found defective after form removal shall be satisfactorily repaired promptly.

3.10 PLAN GRADE AND SURFACE-SMOOTHNESS REQUIREMENTS

The finished surfaces of airfield and heliport pavement, when tested as specified below in SURFACE TESTS, DEFICIENCIES, AND CORRECTIONS, shall conform to the grade line and elevations shown and the surface-smoothness requirements specified herein.

3.10.1 Plan Grade

The finished surfaces of the pavement shall conform, within the tolerances shown in Table 1, to the lines, grades, and cross sections shown. The finished surface of the pavements shall vary not more than 12.7 mm above or below the plan grade line or elevation established and approved at the jobsite in accordance with GRADE CONTROL above. However, the above 12.7 mm deviation from the approved grade line and elevation will not be permitted in areas where closer conformance with planned grade and elevation is required for the proper functioning of appurtenant structures. The finished surfaces of new abutting pavements shall coincide at their juncture. Where a new pavement abuts an existing pavement, transition pavement strip of the type and dimensions indicated shall be installed.

3.10.2 Surface Smoothness

The finished surface of pavements shall have no abrupt change of 3.2 mm or more and shall not deviate from the testing edge of an approved 3.7 m straightedge more than the tolerances shown for the respective pavement

category in Table 1 below:

TABLE 1

Item No.	Pavement Category	Direction of Testing	Tolerances
1.	All paved areas	Longitudinal	6.4 mm
		Transverse	6.4 mm

3.11 SURFACE TESTS, DEFICIENCIES AND CORRECTIONS

The finished surface of each pavement category of the contract shall be tested for conformance with the respective requirements of PLAN GRADE AND SURFACE-SMOOTHNESS REQUIREMENTS above.

3.11.1 Equipment

The Contractor shall furnish and maintain at the jobsite in good condition, one 3.7 m straightedge for each paving spread for use in testing the fresh and hardened portland-cement concrete surfaces. These straightedges shall be constructed of aluminum or magnesium alloy and shall have blades of box or box-girder cross section with flat bottom, adequately reinforced to insure rigidity and accuracy. Straightedges shall have handles for operation on the pavement.

3.11.2 Grade Conformance Tests

Each pavement category will be checked for conformance with subparagraph Plan Grade above. The finished surface will be treated by the Contracting Officer by running lines of levels at intervals of 7.6 m or less apart longitudinally and transversely to determine the elevation of the completed pavement. Within 30 days after the completion of concrete placement in the respective pavement areas, the Contracting Officer will inform the Contractor in writing of all areas defective in plan-grade requirements.

3.11.3 Surface-smoothness Determinations

After the concrete has hardened sufficiently to permit walking thereon, but not later than 36 hours after placement, the surface of the pavement shall be tested by the Contractor with a 3.7 m straightedge or other approved device, operated in such manner as to reveal all surface irregularities exceeding the tolerances specified in Table 1 above, except that deviations from the approved straightedge greater than specified tolerances caused by edge slump along slip formed longitudinal construction joints shall not be considered in smoothness determinations in the transverse direction. Deviations greater than specified tolerances caused by high areas along slipformed longitudinal construction joints shall be considered in smoothness determination in the transverse direction. The entire area of the pavement shall be tested in both a longitudinal and transverse direction on parallel lines ten feet or less apart. The straightedge shall be held in contact with the surface and moved ahead one-half the length of the straightedge for each successive measurement. Straightedge lines shall be carried continuously across joints. Other devices that reveal surface irregularities exceeding specified tolerances may be used when approved. Straightedge testing for acceptance or rejection of the finished pavement surface will be performed by the Contracting Officer as soon as possible and not later than 48 hours after the end of the curing period, except that straightedge testing across longitudinal construction joints will be accomplished with 48 hours after the end of the curing period of the

concrete placed in the adjacent lane.

3.11.4 Deficiencies and Corrections

High areas shall be reduced either by rubbing the freshly finished concrete with carborundum brick and water when the concrete is less than 36 hours old or by grinding the hardened concrete with an approved surface grinding machine when the concrete is older than 36 hours. The area corrected by grinding the hardened surface shall not exceed 5 percent of the area of any integral slab and the depth of grinding shall not exceed 63 mm. All pavement areas requiring plan grade, surface smoothness or edge slump corrections in excess of the limits specified above, shall be removed and replaced in conformance with Paragraph: REMOVAL AND REPLACEMENT OF DEFECTIVE PAVEMENT AREAS. Areas exceeding 2.3 square meter that have been corrected by rubbing or grinding will be retextured by transverse grooving.

The grooves shall be 3.2 to 6.4 mm on 50.8 mm centers and shall be carried into, and tapered to zero depth within the non-corrected surface. All areas in which rubbing or grinding has been performed will be subject to the thickness tolerances specified in Paragraph: TOLERANCE IN PAVEMENT THICKNESS.

3.12 TOLERANCES IN PAVEMENT THICKNESS

Pavements shall be of the thicknesses indicated on the plans. Deficiencies in the thickness shall be treated as described below. Testing shall be the responsibility of the Contractor and shall be performed by an approved commercial testing laboratory at no additional cost to the Government.

3.12.1 Thickness Determination

The thickness of the pavement shall be determined on the basis of measurements made on cores drilled from points in the pavement, within seven days after placement of the concrete. Cores generally shall be taken from every other lane of the paved area or as directed by the Contracting Officer. Measurement of individual cores shall be performed in accordance with ASTM C 174. The core holes shall be refilled by the Contractor with portland cement concrete bonded to the pavement with epoxy-resin grout.

3.12.2 Permissible Deficiency

Permissible deficiency in pavement thickness will be up to but not including 6.4 mm of the specified thickness.

3.12.2.1 Pavement Deficient in Thickness

When measurement of any core indicates that the pavement is deficient in thickness 6.4 mm or more, additional cores shall be drilled at 7.6 meters intervals along the center line of the lane on each side of the deficient core, until the cores indicate that the deficiency in thickness is less than 6.4 mm. Pavement areas deficient in slab thickness 6.4 mm or more shall be removed or replaced with pavement of the indicated thickness in conformance with Paragraph: REMOVAL AND REPLACEMENT OF DEFECTIVE PAVEMENT AREAS. Partial slabs to be removed and replaced shall extend across the full paving lane width midway between adjacent cores or to the regularly scheduled transverse joint should such a joint fall between the cores. If the Contractor believes that the cores and measurement taken are not sufficient to indicate fairly the actual thickness of the pavement, additional cores and measurements will be taken provided the Contractor will bear the extra cost of drilling the cores and filling the holes in the

pavement as directed. When surface grinding and texture restoration is required that results in thickness deficiencies which exceed the permissible deviations, the concrete removal and replacement requirements will apply as contained in Paragraph: REMOVAL AND REPLACEMENT OF DEFECTIVE PAVEMENT AREAS.

3.13 REPAIRS OF DEFECTIVE PAVEMENT SLABS

Broken slabs, random cracks, nonworking contraction joints near cracks, and spalls along joints and cracks shall be replaced or repaired as specified below. The Contracting Officer will be responsible for determining, by means of a structural evaluation, whether defective pavement shall be repaired as specified below or replaced as specified in Paragraph: REMOVAL AND REPLACEMENT OF DEFECTIVE PAVEMENT AREAS.

3.13.1 Spalls

Spalls along joints or at other locations shall be repaired as specified in TM 5-822-9 at no additional cost to the Government.

3.13.2 Broken Slabs

Broken slabs and random cracks shall be repaired by pressure epoxy-grout injection as specified hereinafter at no additional cost to the Government.

3.13.2.1 Materials

Epoxy-resin based binder shall be two-component material formulated to meet the requirements of ASTM C 881, Type I, Grade I, Class determined by ambient temperature. Epoxy grout mixture shall be in accordance with manufacturer's recommendations for each particular area to be repaired.

3.13.2.2 Epoxy Injection

3.13.2.2.1 Preparation of Crack Area

Remove all surface contamination by wire brushing, scraping or light sandblasting and remove dust in crack with light air jet. After approval of the preparation operation, the Contractor shall apply a seal to the surface of the crack, leaving ports for injection of epoxy material in accordance with the manufacturer's recommendations. After epoxy injection, the Contractor shall deepen the adjacent sawed joint to at least 1/3 the pavement thickness.

3.14 Epoxy Injection Placement

The Contractor shall perform the necessary drilling and grouting at all random cracks which develop. The epoxy material shall be proportioned and injected as recommended by the manufacturer of the material for the intended use. The concrete cracks shall be mapped and the injection shall be on center-to-center spacing necessary to perform structural bonding to the full depth of the crack. Epoxy injection of cracks shall not be started until the concrete has cured for a minimum of 7 days and the injection shall be completed within 14 days after placement.

3.15 REMOVAL AND REPLACEMENT OF DEFECTIVE PAVEMENT AREAS

Defective pavement shall be removed and replaced as specified herein with pavements of the thickness and quality required by these specifications.

In no case shall concrete removal and replacement result in a slab less than the full paving lane width or a joint less than 3 meters from a regularly scheduled transverse joint. When a portion of the unfractured slab is replaced, a saw cut three inches deep shall be made transversely across the slab in the required location, and the concrete shall be removed to provide an essentially vertical face in the remaining portion of the slab. Just prior to placement of concrete, the slab face shall be cleaned of debris and loose concrete, dust removed with light air jet, and then thoroughly coated with a thixotropic epoxy-resin adhesive manufactured specifically for bonding fresh portland cement concrete to existing hardened concrete. Longitudinal construction joints and transverse contraction joints shall not be coated with epoxy-resin adhesive. Asphaltic emulsion or other approved bond-breaking medium shall be pointed on vertical construction and contraction joint faces. Longitudinal and transverse joints of the replaced slab or portion thereof shall be constructed as indicated. The joints shall be sealed as specified in SECTION: JOINT SEALING IN CONCRETE PAVEMENTS. The replaced pavement will be paid for at the contract price but no payment will be made for the defective pavements removed nor for the cost of removing the defective pavements.

3.16 JOINTS

3.16.1 Longitudinal Construction Joints

Longitudinal construction joints between paving lanes shall be located as indicated. When the concrete is placed using stationary forms, metal forms securely fastened to the concrete form shall be used to form the keyway in the plastic concrete. Longitudinal construction joints shall be edged and subsequently sawed to provide a groove at the top conforming to the details and dimensions indicated.

3.16.2 Transverse Construction Joints

Transverse construction joints shall be installed at the end of each day's placing operations and at any other points within a paving lane when concrete placement is interrupted for 30 minutes or longer. Insofar as practicable, transverse construction joints shall be installed in the location of a planned joint. When concrete placement cannot be continued, the transverse construction joint may be installed within the slab unit but not less than 3 meters from a planned transverse joint. Transverse construction joints shall be doweled as shown. When the construction joint is located at planned transverse joints, one half of each dowel shall be painted and oiled to permit movement at the joint. These joints shall be edged and subsequently sawed to provide a groove at the top conforming to the details and dimensions indicated.

3.16.3 Expansion Joints

Expansion joints shall be formed by means of a preformed filler material. The filler shall be securely held in position by means of approved metal supports which shall remain in the pavement. A removable metal channel cap bar shall be used to hold the parts of the joint in proper position and protect the filler from damage during concreting operations. The cap bar shall be removable without damage to the pavement to provide a space for sealing of the joint. Expansion joints shall be formed about structures and features that project through, into, or against the pavement, using joint filler of the type, thickness, and width indicated, and installed in such manner as to form a complete, uniform separation between the structure

and pavement.

3.16.4 Contraction Joints

Transverse and longitudinal contraction joints shall be sawed and constructed as indicated. Longitudinal contraction joints shall be constructed by sawing a groove in the hardened concrete with a power-driven saw in conformance with subparagraph 3.12.4.1 below, unless otherwise approved. Transverse contraction joints shall be constructed in conformance with subparagraphs 3.12.4.1 or 3.12.4.2 below, unless otherwise approved.

3.16.4.1 Sawed Joints

Sawed joints shall be constructed by sawing a groove in the concrete with a 3.2 mm blade to the full depth as indicated. After expiration of the curing period, the upper portion of the groove shall be widened by sawing to the width and depth indicated. The time of sawing shall vary depending on existing and anticipated weather conditions, and shall be such as to prevent uncontrolled cracking of the pavement. Sawing of the joints shall commence as soon as the concrete has hardened sufficiently to permit cutting the concrete without chipping, spalling, or tearing. The sawed faces of joints will be inspected for undercutting or washing of the concrete due to the early sawing, and sawing shall be delayed if undercutting is sufficiently deep to cause structural weakness or excessive toughness in the joint. The sawing operation shall be carried on as required during both day and night regardless of weather conditions. The joints shall be sawed at the required spacing consecutively in the sequence of the concrete placement. The saw cut shall not vary more than 12.7 mm from the true joint alignment. Before sawing a joint, the concrete shall be examined closely for cracks, and the joint shall not be sawed if a crack has occurred near the joint location. Sawing shall be discontinued when a crack develops ahead of the saw cut. Immediately after joint is sawed, the saw cut and adjacent concrete surface shall be thoroughly flushed with water until all waste from sawing is removed from the joint. Any membrane-cured surface damaged during the sawing operations shall be resprayed as soon as the surface becomes dry. An ample supply of saw blades shall be available on the job before concrete placement is started, and at least one standby sawing unit in good working order shall be available at the jobsite at all times during the sawing operation.

3.16.5 Dowels

3.16.5.1 Fixed Form Installation

Fixed form installation of dowels shall be prepared and placed across joints where indicated, correctly aligned and securely held in the proper horizontal and vertical position during placing and finishing operations. Installation by removing and replacing dowels in preformed holes will not be permitted. Dowels in longitudinal and transverse construction joints shall be held securely in place parallel to the surface as indicated, by means of devices fastened to the form. Dowels in longitudinal joints shall be omitted when the center of the dowel would be located within a horizontal distance from a transverse joint equal to 1/4 of slab thickness.

Dowels shall be installed within 3.2 mm per meter of length of correct alignment. The Contractor shall furnish as approved template for checking the position of the dowels. The portion of each dowel intended to move within the concrete or expansion cap shall be painted with one coat of red-lead or blue-lead paint. The painted portion shall be wiped clean and

coated with a film of lubricating oil before concrete is placed.

3.16.6 Sealed Joints

Joints shall be sealed immediately following curing of the concrete or as soon thereafter as weather conditions permit, as directed. Joints shall be sealed as specified in SECTION: JOINT SEALING IN CONCRETE PAVEMENTS.

3.17 PAVEMENT PROTECTION

The Contractor shall protect the pavement against all damage prior to final acceptance of the work by the Government. Traffic shall be excluded from the pavement until the concrete is at least 14 days old, or for a longer period if so directed. As a construction expedient in paving intermediate lanes between newly paved lanes, operation of the paver and batch-hauling equipment will be permitted on the pavement after the pavement has been cured for seven days and the joints have been sealed or otherwise protected. Also, the subgrade planer, a concrete finishing machine, and similar equipment may be permitted to ride upon the edges of previously constructed slabs when the concrete has attained a minimum flexural strength of 2.8 Mpa, and provided further that adequate means are furnished to prevent damage to the slab edge.

3.18 CONTRACTOR QUALITY CONTROL

3.18.1 General

The Contractor shall perform the inspection and tests described above and in Paragraph: INSPECTION DETAILS AND FREQUENCY OF TESTING. All testing shall be accomplished by use of the Contractor's own laboratory or by using the services of a commercial laboratory approved by the Contracting Officer. The Government reserves the right to check laboratory equipment employed for compliance with the test standards, and the right to sample and test materials at any time.

3.18.2 Inspection Details and Frequency of Testing

3.18.2.1 Fine Aggregate

3.18.2.1.1 Grading

During each shift when the concrete plant is operating there shall be one sieve analysis in accordance with ASTM C 136 for the fine aggregate.

3.19 Moisture Content

Two tests for moisture content in accordance with ASTM C 70 and ASTM C 566 will be made during each shift of mixing plant operation. An additional test shall be made whenever the slump is shown to be out of control or excessive variation in workability is reported by the placing foreman.

3.20 Coarse Aggregate

During each shift in which concrete plant is operating there shall be a sieve analysis in accordance with ASTM C 136 for each size of coarse aggregate. Samples shall be taken from the batch plant bins.

3.21 Deleterious Materials

During each shift there shall be one petrographic examination for deleterious materials made in accordance with the applicable provisions of ASTM C 295 and the requirements herein before stated, of each size of coarse aggregate. Samples shall be taken from the batch plant bins. Frequency of testing may be reduced as approved following tests that meet requirements stated for 5 shifts of concrete placement.

3.22 Scales

The accuracy of the scales shall be checked by test weights as directed by the Contracting Officer, for conformance with the applicable requirements of NBS H44. Once a week the accuracy of each batching device shall be checked during a weighing operation by noting and recording the required weight, and the actual weight batched.

3.23 Batch-Plant Control

When the concrete plant is operating, the measurement of all constituent materials including cement, each size of aggregate, water and admixtures shall be continuously monitored. The aggregate weights and amount of water subtracted to compensate for free moisture in the aggregates shall be adjusted as necessary. The amount of air-entraining agent shall be adjusted to control air content within specified limits. A report shall be prepared indicating type and source of cement used, amount and source of admixtures used, aggregate source, the required aggregate and water weights per cubic meter, amount of water as free moisture in each size of aggregate and the batched aggregate and water weights per cubic yard for each class of concrete batched during plant operation.

3.24 Concrete

3.24.1 Air Content Tests

Two tests for air content shall be made on randomly selected batches of concrete during each shift of concrete production. Additional tests shall be made when excessive variation in workability is reported by the placing foreman or Government inspector. Tests shall be made in accordance with ASTM C 231.

3.24.2 Slump Tests

A minimum of two slump tests shall be made on randomly selected batches of each class of concrete during each 8 hour period of concrete production in accordance with ASTM C 143. Additional tests shall be made when excessive variations in workability is reported by the placing foreman or Government inspector.

3.24.3 Test Cylinders

A minimum of one set of four cylinders shall be made for each shift of concrete placement. However, at the start of paving operations and when the aggregate source, aggregate characteristics, or mix proportioning is changed, additional sets may be required until the Contracting Officer is satisfied that the concrete mixture being used complies with the strength requirements of these specifications. Test cylinders shall be tested in pairs at 7 days and 28 days of age. One slump and air content test of those herein before specified shall be taken with each set of cylinders. Concrete samples shall be secured in conformance with ASTM C 31, except that the use of cardboard molds will not be permitted.

3.25 Curing

No curing compound shall be applied until the Contractor has verified that the compound is properly mixed and ready for spraying. At the end of each shift the Contractor shall determine the quantity of compound used and the area of concrete surface covered and compute the rate of coverage in meter per liter, noting whether coverage is uniform.

3.26 Reports

All results of tests conducted at the project site shall be reported in accordance with SECTION: CONSTRUCTION QUALITY CONTROL.

3.27 CONSTRUCTION QUALITY CONTROL

Attention is directed to SECTION: CONSTRUCTION QUALITY CONTROL which requires the Contractor to perform quality control inspection, testing, and reporting.

-- End of Section --

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SECTION 02660

WATER DISTRIBUTION SYSTEM

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 1599	(1988) Short-Time Hydraulic Failure Pressure of Plastic Pipe, Tubing, and Fittings
ASTM D 1784	(1992) Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
ASTM D 2467	(1993) Socket-Type Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
ASTM D 2564	(1993) Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems
ASTM D 2657	(1990) Heat-Joining Polyolefin Pipe and Fittings
ASTM D 2774	(1972; R 1983) Underground Installation of Thermoplastic Pressure Piping
ASTM D 2855	(1993) Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings
ASTM D 2996	(1995) Filament-Wound "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe
ASTM D 2997	(1990) Centrifugally Cast "Fiberglass" (Glass-Fiber-Reinforced-Thermosetting-Resin) Pipe
ASTM D 3839	(1994a) Underground Installation of "Fiberglass" (Glass-Fiber-Reinforced Thermosetting Resin) Pipe
ASTM F 477	(1993) Elastomeric Seals (Gaskets) for Joining Plastic Pipe

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C104	(1990) Cement-Mortar Lining for
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Ductile-Iron Pipe and Fittings for Water

AWWA C110	(1993) Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In. (75 mm through 1200 mm), for Water and Other Liquids
AWWA C111	(1990) Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
AWWA C153	(1994) Ductile-Iron Compact Fittings, 3 In. Through 16 In., for Water and Other Liquids
AWWA C500	(1993) Gate Valves for Water and Sewerage Systems
AWWA C502	(1985) Dry-Barrel Fire Hydrants
AWWA C503	(1988) Wet-Barrel Fire Hydrants
AWWA C509	(1994) Resilient-Seated Gate Valves for Water and Sewerage Systems
AWWA C651	(1992) Disinfecting Water Mains
AWWA C900	(1989; C900a) Polyvinyl Chloride (PVC) Pressure Pipe, 4 In. Through 12 In., for Water Distribution
AWWA C901	(1988; Errata Apr 1988) Polyethylene (PE) Pressure Pipe and Tubing, 1/2 In. Through 3 In., for Water Service
AWWA C950	(1988) Fiberglass Pressure Pipe
AWWA M23	(1980) Manual: PVC Pipe - Design and Installation

ASBESTOS CEMENT PIPE PRODUCERS ASSOCIATION (ACPPA)

ACPPA-01	(1988) Recommended Work Practices for A/C Pipe
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DUCTILE IRON PIPE RESEARCH ASSOCIATION (DIPRA)

DIPRA-01	(1992; Errata May 1993) Thrust Restraint Design for Ductile Iron Pipe
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FEDERAL SPECIFICATIONS (FS)

FS TT-E-489	(Rev. J) Enamel, Alkyd, Gloss, Low Voc Content
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NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 24	(1992) Installation of Private Fire Service Mains and Their Appurtenances
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NFPA 49	(1991) Hazardous Chemicals Data
NFPA 325M	(1991) Fire Hazard Properties of Flammable Liquids, Gases, and Volatile Solids
NFPA 704	(1990) Identification of the Fire Hazards of Materials

NSF INTERNATIONAL (NSF)

NSF Std 14	(1965; Rev Nov 1990) Plastics Piping System Components and Related Materials
------------	------------------------------------------------------------------------------

STEEL STRUCTURES PAINTING COUNCIL (SSPC)

SSPC Paint 25	(1991) Red Iron Oxide, Zinc Oxide, Raw Linseed Oil and Alkyd Primer (without Lead and Chromate Pigments)
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1.2 PIPING

This section covers water supply service lines, and connections to building service at a point approximately 1.5 m outside buildings and structures to which service is required. The Contractor shall have a copy of the manufacturer's recommendations for each material or procedure to be utilized available at the construction site at all times.

1.2.1 Supply Lines 80 mm (3 Inches) or Larger

Piping for water supply lines 80 mm (3 inches) or larger shall be polyvinyl chloride (PVC) plastic through 900 mm (36 inch) nominal diameter, filament-wound reinforced or centrifugally cast reinforced thermosetting resin, or reinforced plastic mortar pressure pipe, unless otherwise shown or specified.

1.2.2 Sprinkler Supply Lines

Piping for water lines supplying sprinkler systems for building fire protection shall conform to NFPA 24 from the point of connection with the water distribution system to the building 1.5 m line.

1.2.3 Plastic Pipe

All plastic piping system components (PVC, polyethylene, thermosetting resin and reinforced plastic mortar pressure) intended for transportation of potable water shall comply with NSF Std 14 and shall be legibly marked with their symbol.

1.2.4 Excavation, Trenching, and Backfilling

Excavation, trenching, and backfilling shall be in accordance with the applicable provisions of Section 02222 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS, except as modified herein.

1.3 MANUFACTURER'S REPRESENTATIVE

The Contractor shall negotiate to have a manufacturer's field

representative present at the jobsite during the installation and testing of PE, RTRP, and/or RPMP pipe to provide technical assistance and to verify that the materials are being installed in accordance with the manufacturer's prescribed procedures. When the representative feels that the Contractor is installing and testing the PE, RTRP, and/or RPMP pipe in a satisfactory manner, certification shall be written to note which individuals employed by the Contractor are capable of properly installing the pipe. The field representative shall advise the Contractor of unsatisfactory conditions immediately when they occur. Such conditions include improper diameter of pipe ends, damaged interior liner, poorly prepared joints, improper curing of joints, moving pipe before joints are cured, bending pipe to follow abrupt changes in trench contours, leaving pipe ends open in trench overnight, not properly drying joints after rain storms, exceeding effective adhesive life, sharp objects in trench bed, backfill that could damage pipe, improper procedure for concrete encasement of pipe, omission of thrust blocks at changes in direction or any other conditions which could have an adverse effect on the satisfactory completion and operation of the piping system.

1.4 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL PROCEDURES:

SD-06 Instructions

Installation; FIO.

The manufacturer's recommendations for each material or procedure to be utilized.

SD-08 Statements

Waste Water Disposal Method; FIO.

The method proposed for disposal of waste water from hydrostatic tests and disinfection, prior to performing hydrostatic tests.

Satisfactory Installation; FIO.

A statement signed by the principal officer of the contracting firm stating that the installation is satisfactory and in accordance with the contract drawings and specifications and the manufacturer's prescribed procedures and techniques, upon completion of the project and before final acceptance.

SD-13 Certificates

Manufacturer's Representative; FIO.

The name and qualifications of the manufacturer's representative and written certification from the manufacturer that the representative is technically qualified in all phases of PE, RTRP, and/or RPMP pipe laying and jointing and experienced to supervise the work and train the

Contractor's field installers, prior to commencing installation.

Installation; FIO.

A statement signed by the manufacturer's field representative certifying that the Contractor's personnel are capable of properly installing the pipe on the project.

1.5 HANDLING

Pipe and accessories shall be handled so as to ensure delivery to the trench in sound, undamaged condition. Particular care shall be taken not to injure the pipe coating or lining. If the coating or lining of any pipe or fitting is damaged, the repair shall be made by the Contractor at his expense in a satisfactory manner. No other pipe or material of any kind shall be placed inside a pipe or fitting after the coating has been applied. Pipe shall be carried into position and not dragged. Use of pinch bars and tongs for aligning or turning pipe will be permitted only on the bare ends of the pipe. The interior of pipe and accessories shall be thoroughly cleaned of foreign matter before being lowered into the trench and shall be kept clean during laying operations by plugging or other approved method. Before installation, the pipe shall be inspected for defects. Material found to be defective before or after laying shall be replaced with sound material without additional expense to the Government. Rubber gaskets that are not to be installed immediately shall be stored in a cool and dark place.

1.5.1 Polyethylene (PE) Pipe

PE pipe, fittings, and accessories shall be handled in conformance with AWWA C901.

1.5.2 Miscellaneous Plastic Pipe and Fittings

Polyvinyl Chloride (PVC), Reinforced Thermosetting Resin Pipe (RTRP), and Reinforced Plastic Mortar Pressure (RPMP) pipe and fittings shall be handled and stored in accordance with the manufacturer's recommendations. Storage facilities shall be classified and marked in accordance with NFPA 704, with classification as indicated in NFPA 49 and NFPA 325M.

PART 2 PRODUCTS

2.1 PIPE

Pipe shall conform to the respective specifications and other requirements specified below.

2.1.1 Plastic Pipe

2.1.1.1 Polyethylene Plastic (PE)

Pipe, tubing, and heat-fusion fittings shall conform to AWWA C901.

2.1.1.2 Polyvinyl Chloride (PVC) Plastic Pipe

Pipe, couplings and fittings shall be manufactured of material conforming to ASTM D 1784, Class 12454B.

- b. Pipe 100 mm (4 inch) through 300 mm (12 Inch) Diameter: Pipe, couplings and fittings shall conform to AWWA C900, Class 150, CIOD pipe dimensions, elastomeric-gasket joint, unless otherwise shown or specified.

2.1.2 Reinforced Plastic Mortar Pressure (RPMP) Pipe

AWWA C950.

2.1.3 Reinforced Thermosetting Resin Pipe (RTRP)

Pipe shall have a quick-burst strength greater than or equal to four times the normal working pressure of the pipe. The quick-burst strength test shall conform to the requirements of ASTM D 1599.

2.1.3.1 RTRP-I

RTRP-I shall conform to ASTM D 2996, except pipe shall have an outside diameter equal to cast iron outside diameter or standard weight steel pipe. The pipe shall be suitable for a normal working pressure of 1.03 MPa (150 psi) at 23 degrees C. The inner surface of the pipe shall have a smooth uniform continuous resin-rich surface liner conforming to ASTM D 2996.

2.1.3.2 RTRP-II

RTRP-II shall conform to ASTM D 2997. Pipe shall have an outside diameter equal to standard weight steel pipe.

2.2 FITTINGS AND SPECIALS

2.2.1 Polyvinyl Chloride (PVC) Pipe

- b. For pipe 100 mm (4 inch) diameter and larger, fittings and specials shall be iron, bell end in accordance with AWWA C110, 1.03 MPa (150 psi) pressure rating unless otherwise shown or specified, except that profile of bell may have special dimensions as required by the pipe manufacturer; or may be fittings and specials of the same material as the pipe with elastomeric gaskets, all in conformance with AWWA C900. Iron fittings and specials shall be cement-mortar lined (standard thickness) in accordance with AWWA C104. Fittings shall be bell and spigot or plain end pipe, or as applicable. Ductile iron compact fittings shall be in accordance with AWWA C153.

2.2.2 RTRP and RPMP Pipe

Fittings and specials shall be compatible with the pipe supplied. Filament wound or molded fittings up to 150 mm (6 inches) shall conform to AWWA C950.

Iron fittings shall be cement-mortar lined in accordance with AWWA C104 and shall conform to AWWA C110 and AWWA C111. Fittings shall be suitable for working and testing pressures specified for the pipe.

2.3 JOINTS

2.3.1 Plastic Pipe

2.3.1.1 Polyethylene (PE) Pipe

Joints for pipe fittings and couplings shall be strong tight joints as specified for PE in Paragraph INSTALLATION. Joints connecting pipe of differing materials shall be made in accordance with the manufacturer's recommendation as approved by the Contracting Officer.

2.3.1.2 Polyvinyl Chloride Pipe

Joints, fittings, and couplings shall be as specified for PVC pipe. Joints connecting pipe of differing materials shall be made in accordance with the manufacturer's recommendations as approved by the Contracting Officer.

2.3.2 RPMP Pipe

Joints shall be mechanical or bell and spigot type with elastomeric gasket.

2.3.3 RTRP

2.3.3.1 RTRP-I, Grade I and 2

Joints shall be bell and spigot with elastomeric gasket, mechanical coupling with elastomeric gasket, threaded and bonded coupling, or tapered bell and spigot with compatible adhesive. All RTRP-I materials shall be products of a single manufacturer.

2.3.3.2 RTRP-II, Grade 1 and 2

Joints shall be the bell and spigot type with elastomeric gasket, bell and spigot with adhesive, butt-jointed with adhesive bonded reinforced overlay, mechanical, flanged, threaded or commercially available proprietary joints, provided they are capable of conveying water at the pressure and temperature of the pipe.

2.3.4 Bonded Joints

[Where indicated] [For all ferrous pipe], a metallic bond shall be provided at each joint, including joints made with flexible couplings, caulking, or rubber gaskets, of ferrous-metallic piping to effect continuous conductivity. The bond wire shall be Size 1/0 copper conductor suitable for direct burial shaped to stand clear of the joint. The bond shall be of the thermal weld type.

2.3.5 Isolation Joints

Isolation joints shall be installed between nonthreaded ferrous and nonferrous metallic pipe, fittings and valves. Isolation joints shall consist of a sandwich-type flange isolation gasket of the dielectric type, isolation washers, and isolation sleeves for flange bolts. Isolation gaskets shall be full faced with outside diameter equal to the flange outside diameter. Bolt isolation sleeves shall be full length. Units shall be of a shape to prevent metal-to-metal contact of dissimilar metallic piping elements.

- a. Sleeve-type couplings shall be used for joining plain end pipe sections. The two couplings shall consist of one steel middle

ring, two steel followers, two gaskets, and the necessary steel bolts and nuts to compress the gaskets.

- b. Split-sleeve type couplings may be used in aboveground installations when approved in special situations and shall consist of gaskets and a housing in two or more sections with the necessary bolts and nuts.

2.4 VALVES

2.4.1 Gate Valves

Gate valves shall be designed for a working pressure of not less than 1.03 MPa (150 psi). Valve connections shall be as required for the piping in which they are installed. Valves shall have a clear waterway equal to the full nominal diameter of the valve, and shall be opened by turning counterclockwise. The operating nut or wheel shall have an arrow, cast in the metal, indicating the direction of opening.

- b. Valves 80 mm (3 inches) and larger shall be iron body, bronze mounted, and shall conform to AWWA C500. Flanges shall not be buried. An approved pit shall be provided for all flanged connections.
- c. Resilient-Seated Gate Valves: For valves 80 to 300 mm (3 to 12 inches) in size, resilient-seated gate valves shall conform to AWWA C509.

2.4.2 Indicator Post for Valves

Each valve shown on the drawings with the designation "P.I.V." shall be equipped with indicator post conforming to the requirements of NFPA 24. Operation shall be by a wrench which will be attached to each post.

2.5 VALVE BOXES

Valve boxes shall be cast iron or concrete, except that concrete boxes may be installed only in locations not subjected to vehicular traffic. Cast-iron boxes shall be extension type with slide-type adjustment and with flared base. The minimum thickness of metal shall be 5 mm. Concrete boxes shall be the standard product of a manufacturer of precast concrete equipment. The word "WATER" shall be cast in the cover. The box length shall adapt, without full extension, to the depth of cover required over the pipe at the valve location.

2.6 FIRE HYDRANTS

Hydrants shall be dry-barrel type conforming to AWWA C502 with valve opening at least 125 mm (5 inches) in diameter and designed so that the flange at the main valve seat can be removed with the main valve seat apparatus remaining intact, closed and reasonably tight against leakage and with a breakable valve rod coupling and breakable flange connections located no more than 200 mm above the ground grade. Hydrants shall have a 150 mm (6 inch) bell connection, two 65 mm (2-1/2 inch) hose connections and one 115 mm (4-1/2 inch) pumper connection. Outlets shall have American National Standard fire-hose coupling threads. Working parts shall be bronze. Design, material, and workmanship shall be similar and equal to

the latest stock pattern ordinarily produced by the manufacturer. Hydrants shall be painted with one coat of red iron oxide, zinc oxide primer conforming to SSPC Paint 25 and two finish coats of enamel, alkyd, gloss, conforming to CFS TT-E-489, of the installation's standard colors or as directed by the Contracting Officer. Suitable bronze adapter for the 115 mm (4-1/2 inch) outlet, with caps, shall be furnished.

2.7 MISCELLANEOUS ITEMS

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Cutting of Pipe

Cutting of pipe shall be done in a neat and workmanlike manner without damage to the pipe. Unless otherwise recommended by the manufacturer and authorized by the Contracting Officer, cutting shall be done with an approved type mechanical cutter. Wheel cutter shall be used when practicable. Copper tubing shall be cut square and all burrs shall be removed. Squeeze type mechanical cutters shall not be used for ductile iron.

3.1.2 Adjacent Facilities

3.1.2.1 Sewer Lines

Where the location of the water pipe is not clearly defined in dimensions on the drawings, the water pipe shall not be laid closer horizontally than 3 m from a sewer except where the bottom of the water pipe will be at least 300 mm above the top of the sewer pipe, in which case the water pipe shall not be laid closer horizontally than 1.8 m from the sewer. Where water lines cross under gravity-flow sewer lines, the sewer pipe for a distance of at least 3 m each side of the crossing shall be fully encased in concrete or shall be made of pressure pipe with no joint located within 900 mm horizontally of the crossing. Water lines shall in all cases cross above sewage force mains or inverted siphons and shall be not less than 600 mm above the sewer main. Joints in the sewer main, closer horizontally than 900 mm to the crossing, shall be encased in concrete.

3.1.2.2 Water Lines

Water lines shall not be laid in the same trench with sewer lines, gas lines, fuel lines, or electric wiring.

3.1.3 Joint Deflection

3.1.3.1 Flexible Plastic Pipe

Maximum offset in alignment between adjacent pipe joints shall be as recommended by the manufacturer and approved by the Contracting Officer, but in no case shall it exceed 5 degrees.

3.1.4 Placing and Laying

Pipe and accessories shall be carefully lowered into the trench by means of derrick, ropes, belt slings, or other authorized equipment. Under no circumstances shall any of the water-line materials be dropped or dumped into the trench. Care shall be taken to avoid abrasion of the pipe

coating. Except where necessary in making connections with other lines or as authorized by the Contracting Officer, pipe shall be laid with the bells facing in the direction of laying. The full length of each section of pipe shall rest solidly upon the pipe bed, with recesses excavated to accommodate bells, couplings, and joints. Pipe that has the grade or joint disturbed after laying shall be taken up and relaid. Pipe shall not be laid in water or when trench conditions are unsuitable for the work. Water shall be kept out of the trench until joints are complete. When work is not in progress, open ends of pipe, fittings, and valves shall be securely closed so that no trench water, earth, or other substance will enter the pipes or fittings. Where any part of the coating or lining is damaged, the repair shall be made by the Contractor at his expense in a satisfactory manner. Pipe ends left for future connections shall be valved, plugged, or capped, and anchored, as shown.

3.1.4.2 Plastic Pipe Installation

RTRP shall be installed in accordance with ASTM D 3839. RPMP shall be installed in accordance with the recommendations of the manufacturer. PE Pipe shall be installed in accordance with ASTM D 2774. PVC pipe shall be installed in accordance with AWWA M23.

3.1.4.3 Connections

Where connections are made between new work and existing mains, the connections shall be made by using specials and fittings to suit the actual conditions. When made under pressure, these connections shall be installed using standard methods as approved by the Contracting Officer. Connections to existing asbestos-cement pipe shall be made in accordance with ACPPA-01.

3.1.4.4 Penetrations

Pipe passing through walls of valve pits and structures shall be provided with ductile-iron or Schedule 40 steel wall sleeves. Annular space between walls and sleeves shall be filled with rich cement mortar. Annular space between pipe and sleeves shall be filled with mastic.

3.1.4.5 Flanged Pipe

Flanged pipe shall only be installed above ground or with the flanges in valve pits.

3.1.5 Jointing

3.1.5.1 Polyethylene (PE) Pipe

Jointing shall comply with ASTM D 2657, Technique I-Socket Fusion or Technique II-Butt Fusion.

3.1.5.2 Polyvinyl Chloride (PVC) Plastic Pipe

- a. Pipe less than 100 mm (4 inch) diameter: Threaded joints shall be made by wrapping the male threads with approved thread tape or applying an approved lubricant, then threading the joining members together. The joint shall be tightened using strap wrenches to prevent damage to the pipe and/or fitting. To avoid excessive torque, joints shall be tightened no more than one thread past hand-tight. Preformed rubber-ring gaskets for elastomeric-gasket joints shall be made in accordance with requirements of ASTM F 477

and as required herein. All pipe ends for push-on joints shall be beveled to facilitate assembly and marked to indicate when the pipe is fully seated. The gasket shall be prelubricated to prevent displacement. The gasket and ring groove in the bell or coupling shall match. The manufacturer of the pipe or fitting shall supply the elastomeric gasket. Couplings shall be provided with stops or centering rings to assure that the coupling is centered on the joint. Solvent cement joints shall use sockets conforming to the requirements of ASTM D 2467. The solvent cement used shall meet the requirements of ASTM D 2564; the joint assembly shall be made in accordance with ASTM D 2855 and the manufacturer's specific recommendations.

- b. Pipe 100 mm (4 inch) through 300 mm (12 inch) diameter: Joints shall be elastomeric-gasket as specified in AWWA C900. Jointing procedure shall be as specified for pipe less than 100 mm (4 inch) diameter with configuration using elastomeric ring gasket.
- c. Pipe 350 mm (14 inch) through 900 mm (36 inch) diameter: Joints shall be elastomeric-gasket push-on joints made in accordance with AWWA M23.

3.1.5.3 RTRP I, RTRP II and RPMP Pipe

- a. RTRP I: Assembly of the pipe shall be done in strict conformance with the manufacturer's written instruction and installation procedures. Field joints shall be prepared as specified by the pipe manufacturer. Several pipe joints having interference-fit type couplings may be field bonded and cured simultaneously. However, the pipe shall not be moved nor shall additional joints be made until the previously laid joints are completely cured. Joints not having interference-fit type coupling shall be fitted with a clamp which shall hold the joint rigidly in place until the joint cement has completely cured. The clamps shall have a protective material on the inner surface to prevent damage to the plastic pipe when the clamp is tightened in place. The pipe manufacturer shall provide a device or method to determine when the joint is pulled against the pipe stop. Additionally, the pipe manufacturer shall furnish a gauge to measure the diameter of the spigot ends to ensure the diameter conforms to the tolerances specified by the manufacturer. All pipe ends shall be gauged. Factory certified tests shall have been satisfactorily performed to verify that short-term rupture strength is 10.3 MPa (1,500 psi) or greater when carried out in accordance with ASTM D 1599. All field bonded epoxy-cemented joints, regardless of ambient temperature, shall be cured with a self-regulating thermostatically temperature controlled electrical heating blanket for the time and temperature recommended by the manufacturer for the applicable size and type of joint, or by an alternate heating method recommended by the manufacturer and approved by the Contracting Officer. The joint sections shall not be moved during heating or until the joint has cooled to ambient temperature.
- b. RTRP II: A reinforced overlay joint shall be used to join sections together through a placement of layers of reinforcement fiberglass roving, mat, tape or fabric thoroughly saturated with compatible catalyzed resin.
- c. Fittings and Specials for RTRP and RPMP Pipe: Metal to RTRP and

RPMP pipe connections shall be made by bolting steel flanges to RTRP and RPMP pipe flanges. Cast-iron fitting with gasket bell or mechanical joint may be used with RTRP if pipe has cast iron outside diameter. Steel flanges shall be flat-faced type. Where raised-face steel flanges are used, spacer rings shall be used to provide a flat-face seat for RTRP and RPMP pipe flanges. A full-face Buna "N" gasket 3.2 mm (1/8 inch) thick with a shore hardness of 50-60 shall be used between all flanged connections. The RTRP and RPMP pipe flange shall have raised sealing rings. Flat washers shall be used under all nuts and bolts on RTRP and RPMP pipe flanges. Bolts and nuts shall be of noncorrosive steel and torqued to not more than 135 Newton meters. Flanges shall not be buried. A concrete pit shall be provided for all flanged connections.

3.1.5.4 Bonded Joints

Bonded joints shall be installed in accordance with details specified for joints in paragraph JOINTS.

3.1.5.5 Isolation Joints and Dielectric Fittings

Isolation joints and dielectric fittings shall be installed in accordance with details specified in paragraph JOINTS. Dielectric unions shall be encapsulated in a field-poured coal-tar covering, with at least 3 mm thickness of coal tar over all fitting surfaces.

3.1.5.6 Connections

Connections between different types of pipe and accessories shall be made with transition fittings approved by the Contracting Officer.

3.1.6 Service Lines

Service lines shall include the pipeline connecting building piping to water distribution lines to the connections with the building service at a point approximately 1.5 m outside the building where such building service exists. Where building services are not installed, the Contractor shall terminate the service lines approximately 1.5 m from the site of the proposed building at a point designated by the Contracting Officer. Such service lines shall be closed with plugs or caps. All service stops and valves shall be provided with service boxes. Service lines shall be constructed in accordance with the following requirements:

3.1.6.1 Service Lines Larger than 50 mm (2 Inches)

Service lines larger than 50 mm (2 inches) shall be connected to the main by a tapped saddle, tapping sleeve and valve, service clamp or reducing tee, depending on the main diameter and the service line diameter, and shall have a gate valve. Lines 80 mm (3 inches) and larger may use rubber-seated butterfly valves as specified above, or gate valves.

3.1.6.2 Service Lines for Sprinkler Supplies

Water service lines used to supply building sprinkler systems for fire protection shall be connected to the water distribution main in accordance with NFPA 24.

3.1.7 Setting of Fire Hydrants, Valves and Valve Boxes

3.1.7.1 Fire Hydrants

Fire hydrants shall be located and installed as shown. Each hydrant shall be connected to the main with a 150 mm (6 inch) branch line having at least as much cover as the distribution main. Hydrants shall be set plumb with pumper nozzle facing the roadway, with the center of the lowest outlet not less than 450 mm above the finished surrounding grade, and the operating nut not more than 1.2 m above the finished surrounding grade. Fire hydrants designated on the drawings as low profile shall have the lowest outlet not less than 450 mm above the finished surrounding grade, the top of the hydrant not more than 600 mm above the finished surrounding grade. Except where approved otherwise, the backfill around hydrants shall be thoroughly compacted to the finished gradeline immediately after installation to obtain beneficial use of the hydrant as soon as practicable. The hydrant shall be set upon a slab of concrete not less than 100 mm thick and 400 mm square. Not less than 2 cubic meters of free-draining broken stone or gravel shall be placed around and beneath the waste opening of dry barrel hydrants to ensure drainage.

3.1.7.2 Valves

After delivery, valves, including those in hydrants, shall be drained to prevent freezing and shall have the interiors cleaned of all foreign matter before installation. Stuffing boxes shall be tightened and hydrants and valves shall be fully opened and fully closed to ensure that all parts are in working condition. Check, pressure reducing, vacuum, and air relief valves shall be installed in valve pits. Valves and valve boxes shall be installed where shown or specified, and shall be set plumb. Valve boxes shall be centered on the valves. Boxes shall be installed over each outside gate valve unless otherwise shown. Where feasible, valves shall be located outside the area of roads and streets. Earth fill shall be carefully tamped around each valve box or pit to a distance of 1.2 m on all sides of the box, or the undisturbed trench face if less than 1.2 m.

3.1.8 Tapped Tees and Crosses

Tapped tees and crosses for future connections shall be installed where shown.

3.1.9 Thrust Restraint

Plugs, caps, tees and bends deflecting 11-1/4 degrees or more, either vertically or horizontally, on waterlines 100 mm (4 inches) in diameter or larger, and fire hydrants shall be provided with thrust restraints. Valves shall be securely anchored or shall be provided with thrust restraints to prevent movement. Thrust restraints shall be either thrust blocks or, for ductile-iron pipes, restrained joints.

3.1.9.1 Thrust Blocks

Thrust blocking shall be concrete of a mix not leaner than: 1 cement, 2-1/2 sand, 5 gravel; and having a compressive strength of not less than 14 MPa after 28 days. Blocking shall be placed between solid ground and the hydrant or fitting to be anchored. Unless otherwise indicated or directed, the base and thrust bearing sides of thrust blocks shall be poured directly against undisturbed earth. The sides of thrust blocks not subject to thrust may be poured against forms. The area of bearing shall be as shown or as directed. Blocking shall be placed so that the fitting joints will

be accessible for repair. Steel rods and clamps, protected by galvanizing or by coating with bituminous paint, shall be used to anchor vertical down bends into gravity thrust blocks.

3.1.9.2 Restrained Joints

For ductile-iron pipe, restrained joints shall be designed by the Contractor or the pipe manufacturer in accordance with DIPRA-01.

3.2 HYDROSTATIC TESTS

Where any section of a water line is provided with concrete thrust blocking for fitting or hydrants, the hydrostatic tests shall not be made until at least 5 days after installation of the concrete thrust blocking, unless otherwise approved.

3.2.1 Pressure Test

After the pipe is laid, the joints completed, fire hydrants permanently installed, and the trench partially backfilled leaving the joints exposed for examination, the newly laid piping or any valved section of piping shall, unless otherwise specified, be subjected for 1 hour to a hydrostatic pressure test of 1.38 MPa (200 psi). Water supply lines designated on the drawings shall be subjected for 1 hour to a hydrostatic pressure test of 1.38 MPa (200 psi). Each valve shall be opened and closed several times during the test. Exposed pipe, joints, fittings, hydrants, and valves shall be carefully examined during the partially open trench test. Joints showing visible leakage shall be replaced or remade as necessary. Cracked or defective pipe, joints, fittings, hydrants and valves, discovered in consequence of this pressure test shall be removed and replaced with sound material, and the test shall be repeated until the test results are satisfactory. The requirement for the joints to remain exposed for the hydrostatic tests may be waived by the Contracting Officer when one or more of the following conditions is encountered:

- a. Wet or unstable soil conditions in the trench.
- b. Compliance would require maintaining barricades and walkways around and across an open trench in a heavily used area that would require continuous surveillance to assure safe conditions.
- c. Maintaining the trench in an open condition would delay completion of the contract.

The Contractor may request a waiver, setting forth in writing the reasons for the request and stating the alternative procedure proposed to comply with the required hydrostatic tests. Backfill placed prior to the tests shall be placed in accordance with the requirements of Section 02222 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS.

3.2.2 Leakage Test

Leakage test shall be conducted after the pressure tests have been satisfactorily completed. The duration of each leakage test shall be at least 2 hours, and during the test the water line shall be subjected to not less than 1.38 MPa (200 psi) pressure. Water supply lines designated on the drawings shall be subjected to a pressure equal to 1.38 MPa (200 psi). Leakage is defined as the quantity of water to be supplied into the newly laid pipe, or any valved or approved section thereof, necessary to maintain

pressure within 34.5 kPa (5 psi) of the specified leakage test pressure after the pipe has been filled with water and the air expelled. No piping installation will be accepted if leakage exceeds the allowable leakage which is determined by the following formula:

$$L = 0.0001351ND(P \text{ raised to } 1/2 \text{ power})$$

L = Allowable leakage in gallons per hour

N = Number of joints in the length of pipeline tested

D = Nominal diameter of the pipe in inches

P = Average test pressure during the leakage test, in psi gauge

Should any test of pipe disclose leakage greater than that calculated by the above formula, the defective joints shall be located and repaired until the leakage is within the specified allowance, without additional cost to the Government.

3.2.3 Time for Making Test

Except for joint material setting or where concrete thrust blocks necessitate a 5-day delay, pipelines jointed with rubber gaskets, mechanical or push-on joints, or couplings may be subjected to hydrostatic pressure, inspected, and tested for leakage at any time after partial completion of backfill. Cement-mortar lined pipe may be filled with water as recommended by the manufacturer before being subjected to the pressure test and subsequent leakage test.

3.2.4 Concurrent Hydrostatic Tests

The Contractor may elect to conduct the hydrostatic tests using either or both of the following procedures. Regardless of the sequence of tests employed, the results of pressure tests, leakage tests, and disinfection shall be satisfactory as specified. All replacement, repair or retesting required shall be accomplished by the Contractor at no additional cost to the Government.

- a. Pressure test and leakage test may be conducted concurrently.
- b. Hydrostatic tests and disinfection may be conducted concurrently, using the water treated for disinfection to accomplish the hydrostatic tests. If water is lost when treated for disinfection and air is admitted to the unit being tested, or if any repair procedure results in contamination of the unit, disinfection shall be reaccomplished.

3.3 DISINFECTION

3.3.1 Bacteriological Disinfection

Before acceptance of potable water operation, each unit of completed waterline shall be disinfected as prescribed by AWWA C651.

3.3.2 Lead Residual

Following the bacteriological disinfection and testing, the system shall be flushed with a sufficient velocity of water and sufficient tests performed at each hot- and cold-water discharge point until no more than 15 ppb lead residuals remain in the system. All tests and samples shall be performed in accordance with state and, if applicable, Federal regulations. Samples

for testing are to be collected after a 6-hour continuous period of no flushing, and will be considered first draw samples. The commercial laboratory must be certified by the state's approving authority for examination of potable water. Lead residual test results are to be submitted to the Contracting Officer. The system will not be accepted until satisfactory bacteriological results and lead residual test results have been obtained. All flushing and testing for lead residuals, including all costs, are the responsibility of the Contractor.

3.4 CLEANUP

Upon completion of the installation of water lines, and appurtenances, all debris and surplus materials resulting from the work shall be removed.

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SECTION 02611

CONCRETE PAVEMENT FOR PADS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN CONCRETE INSTITUTE (ACI)

ACI 211.1	(1991) Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete
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AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 184	(1990) Fabricated Deformed Steel Bar Mats for Concrete Reinforcement
ASTM A 615	(1995b) Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM A 675	(1990) Steel Bars, Carbon, Hot-Wrought, Special Quality Mechanical Properties.
ASTM C 31	(1991) Making and Curing Concrete Test Specimens in the Field
ASTM C 33	(1993) Concrete Aggregates
ASTM C 70	(1985) Surface Moisture in Fine Aggregate.
ASTM C 94	(1994) Ready-Mixed Concrete
ASTM C 117	(1990) Materials Finer than No. 75-um (No. 200) Sieve in Mineral Aggregates by washing.
ASTM C 123	(1992) Lightweight Pieces in Aggregate.
ASTM C 136	(1995a) Sieve Analysis of Fine and Coarse Aggregates
ASTM C 142	(1990) Clay Lumps and Friable Particles in Aggregates.
ASTM C 143	(1990a) Slump of Hydraulic Cement Concrete
ASTM C 150	(1994) Portland Cement
ASTM C 171	(1992) Sheet Materials for Curing Concrete

ASTM C 174	(1991) Measuring Length of Drilled Concrete Cores.
ASTM C 192	(1990a) Making and Curing Concrete Test Specimens in the Laboratory
ASTM C 231	(1991b) Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C 260	(1994) Air-Entraining Admixtures for Concrete
ASTM C 295	(1990) Petrographic Examination of Aggregates for Concrete.
ASTM C 494	(1992) Chemical Admixtures for Concrete
ASTM C 566	(1989) Total Moisture Content of Aggregate by Drying.
ASTM C 595	(1994a) Blended Hydraulic Cements
ASTM C 618	(1994) Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete
ASTM C 881	(1990) Epoxy-Resin-Base Bonding Systems for Concrete
ASTM D 1751	(1983; R 1991) Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
ASTM D 1752	(1984; R 1992) Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction
ASTM D 2828	(1971; R 1981) Nonbituminous Inserts for Contraction Joints in Portland Cement Concrete Airfield Pavements, Sewable Type.

U.S. ARMY CORPS OF ENGINEERS HANDBOOK FOR CEMENT AND CONCRETE (CRD)

CRD-C 130	(1977) Scratch Hardness of Coarse Aggregate Particles.
CRD-C 300	(1977) Membrane-Forming Compounds for Curing Concrete.

U.S. DEPARTMENT OF COMMERCE, NATIONAL BUREAU OF STANDARDS (NBS),
HANDBOOKS:

H44	Specifications, Tolerances, and Other Technical Requirements for Commercial Weighing and Measuring Devices (Fourth Edition 1971 with Replacement Sheets 1977).
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1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL DESCRIPTIONS:

Proportions of Mix; GA.

The results of trial mix along with a statement giving the maximum nominal coarse aggregate size and the proportions of all ingredients that will be used in the manufacture of each strength of concrete, at least 30 days prior to commencing concrete placing operations. Mix proportioning shall be the responsibility of the Contractor. Aggregate weights shall be based on the saturated surface dry condition. The statement shall be accompanied by test results from an independent commercial testing laboratory, attesting that the proportions selected will produce concrete of the qualities indicated. No substitutions shall be made in the materials used in the work without additional tests to show that the quality of the concrete is satisfactory.

Plant and Equipment; FIO.

Submittals for approval on plant, equipment, and construction methods shall be made no later than 60 days prior to initial placement. The Contracting Officer shall be given access at all times to all parts of the plant and equipment for checking adequacy of the equipment in use; operation of the plant, verifying weights, proportions, temperature, mixing time, and character of the materials.

SD-09 Reports

Sampling and Testing; FIO.

Certified copies of laboratory test reports, including all test data, for admixtures, expansion joint filler, contraction joint inserts and curing compounds. These tests shall be made by an approved commercial laboratory or by a laboratory maintained by the manufacturers of the materials.

SD-13 Certificates

Cementitious Materials; FIO.

Manufacturer's certification of compliance, accompanied by mill test reports attesting that the materials meet the requirements of the specification under which it is furnished for cement or pozzolan. No cement or pozzolan shall be used until notice of acceptance has been given. Cement or pozzolan may be subjected to check testing by the Government from samples obtained at the mill, at transfer points, or at the project site.

1.3 GENERAL REQUIREMENTS

1.3.1 Composition

Concrete shall be composed of cementitious material, fine aggregate, coarse aggregate, water, an air entraining admixture, and at the option of the contractor, other admixtures.

1.3.2 Strength and Air Content

The proportioning of the mix, which shall be based on ACI 211.1, shall use materials approved by the Contracting Officer and in conformance with these specifications, shall be the responsibility of the Contractor. The Contractor shall design the mix to achieve a compressive strength of 28 Mpa at 28 days. Compressive strength shall be determined from laboratory cylinders in accordance with ASTM C 192. Seven day strengths are taken for the purpose of determining early strength of the concrete for construction loading and are not to be considered in evaluating the 28 day strength of the concrete. The air content of the concrete shall be maintained at 6 percent plus or minus 1 percent. The Contracting Officer shall be notified prior to any changes to the proportions of the mix.

1.3.3 Production, Sampling and Testing of Aggregates

For each shift of concrete paving operation, the Contractor shall perform grading, fineness modulus, moisture content, particle shape tests and certain tests for suspect deleterious substances to determine conformance with the specification requirements. Grading, fineness modulus, moisture content, and particle shape tests shall be performed in accordance with PARAGRAPH: CONTRACTOR QUALITY CONTROL. Tests for suspect deleterious substances shall be performed on aggregate samples taken from the aggregate plant. During the first part of the paving operation, sampling and testing for these tests should be once every shift of concrete placement. When the test data from four consecutive tests for each type of testing show only test results which comply with the provisions in these specifications, the frequency of the testing, on approval of the Contracting Officer, may be reduced.

1.4 DELIVERY AND STORAGE OF MATERIALS

1.4.1 Cement and Pozzolan

Cementitious materials shall be dry and free from lumps and caking when delivered. Immediately upon receipt at the site of the work, cementitious materials shall be stored in a dry, weathertight, and properly ventilated structure.

1.4.2 Aggregates

Each size of aggregate shall be stored separately in free-draining stockpiles and shall be handled and stored in such manner as to avoid breakage, segregation, or contamination by foreign materials.

1.5 GRADE CONTROL

The lines and grades shown for each pavement category of the contract shall be established and maintained by means of line and grade stakes placed at the jobsite by the Contractor in accordance with the SPECIAL PROVISIONS. Elevations of all bench marks used by the Contractor for controlling pavement operations at the jobsite and for finished pavement grade lines and elevations will be established and maintained by the Government.

1.6 PROPORTIONING

1.6.1 Mixture Proportions

The proportions of all material entering into the concrete mixtures shall be as determined in Paragraph: STRENGTH AND AIR CONTENT. The proportions will be changed only when necessary to maintain the workability, strength, and standard of quality required for the concrete covered by these specifications, and to meet the varying conditions encountered during the construction. Changes shall be the responsibility of the Contractor, and the Contracting Officer shall be notified in writing. The use of pozzolan is mandatory at a volume of 20 to 30 percent of the total cementitious material used in the mix.

1.6.1.1 Average Strength

In meeting the strength requirements specified, the selected mixture proportion shall produce an average compressive strength exceeding the specified strength by the amount indicated below. Where a concrete production facility has test records, a standard deviation shall be established. Test records from which a standard deviation is calculated shall represent materials, quality control procedures, and conditions similar to those expected; shall represent concrete produced to meet a specified strength or strengths within 7 Mpa of that specified for proposed work; and shall consist of at least 30 consecutive tests. A strength test shall be the average of the strengths of two cylinders made from the same sample of concrete and tested at 28 days or at other test age designated for determination of the specified strength.

1.6.1.2 Test Records Exceeding 29

Required average compressive strength used as the basis for selection of concrete proportions shall be the larger of the specified strength plus the standard deviation multiplied by 1.34 or the specified strength plus the standard deviation multiplied by 2.33 minus 500.

1.6.1.3 Test Records Less Than 29

Where a concrete production facility does not have test records meeting the above requirements but does have a record based on 15 to 29 consecutive tests, a standard deviation may be established as the product of the calculated standard deviation and a modification factor from the following table:

No. of tests (1)	Modification factor for standard deviation
less than 15	See Note
15	1.16
20	1.08
25	1.03
30 or more	1.00

(1) Interpolate for intermediate numbers of tests.

When a concrete production facility does not have field strength test records for calculation of standard deviation or the number of tests is less than 15, the required average strength shall be:

- a. The specified strength plus 7 specified strength of less than 21

MPa.

- b. The specified strength plus 8 for specified strengths of 21 to 35 MPa.

1.6.2 Measurement

All aggregates and cementitious materials shall be measured by weight. Mixing water and air-entraining admixtures may be measured by volume or by weight.

1.6.3 Workability

The water content of the concrete shall be the minimum necessary to obtain the workability required for the specific conditions and methods of placement. The slump of the concrete shall be maintained at the lowest practical value and shall not exceed 50.8 mm for concrete placement using fixed forms or 25.4 mm for slip-form placement, when tested in accordance with ASTM C 143. Every effort shall be made to insure that the concrete, as it reaches the paver, is as uniform as possible from batch to batch. If wet batches are encountered, they shall be wasted. If the addition of water is necessary to provide the required slump to the mixed concrete, the mixture design water-cement ratio shall not be exceeded.

1.7 EQUIPMENT, APPROVAL AND MAINTENANCE

Dependable and sufficient equipment that is appropriate and adequate to meet the approved plan and schedule for the work specified shall be furnished by the Contractor and assembled at the work site sufficiently early before the start of paving to permit thorough inspection, calibration of weighing and measuring devices, adjustment of parts, and making required repairs. The equipment shall be approved in writing by the Contracting Officer and maintained in good working condition by the Contractor.

PART 2 PRODUCTS

2.1 AGGREGATE

Fine and coarse aggregates shall conform to ASTM C 33 and the requirements herein. Coarse aggregate shall consist of crushed or uncrushed gravel, crushed stone, or a combination thereof. Aggregates as delivered to the mixers shall consist of clean, hard, uncoated particles meeting the requirements of ASTM C 33. Dust and other coating shall be removed from the coarse aggregates by washing. Fine aggregate shall consist of natural and/or manufactured sand, or a combination of the two, and shall be composed of clean, hard, durable particles. Dust and other coating shall be removed from the coarse aggregates by washing.

2.1.1 Size and Grading

The maximum nominal size of the coarse aggregate shall be in accordance to ASTM C 33 Table 2, Size No. 57.

2.1.2 Deleterious Substances

The amount of deleterious substances in each size group shall not exceed the limits shown below, determined in accordance with ASTM C 142, ASTM C 117, ASTM C 123, ASTM C 295 and CRD-C 130 (applicable only to material coarser

than 9.5 mm).

Deleterious Materials

Material	Percentage by Weight	
	Coarse Aggregate(1)	Fine Aggregate (2)
Clay lumps and friable particles	1.0	1.0
Material finer than No. 200 sieve	1.0 (3)	3.0
Lightweight particles	1.0 (4)	0.5
Other soft particles	2.0	

NOTES:

1 The total of all deleterious substances shall not exceed 4.0 percent of the weight of the aggregate. The percentage of material finer than No. 200 sieve shall not be included in this total.

2 The total of all deleterious materials shall not exceed 3.0 percent of the weight of the aggregate. Sand shall be washed if material is found to have material finer than the 200 sieve.

3 Limit for material finer than No. 200 sieve will be increased to 1.5 percent for crushed aggregates consisting of crusher dust that is essentially free from clay or shale.

4 The separation medium shall have specific gravity of 2.0.

2.1.3 Sand

Limit percentage of sand, by total weight of aggregate, to 38% in concrete mix

2.2 ADMIXTURES

Admixtures shall conform to the following:

2.2.1 Air-entraining Admixture

Air-entraining admixture shall be an approved substance or compound conforming to ASTM C 260.

2.2.2 Retarder

A retarding admixture shall meet the requirements of ASTM C 494, Type B, except that the 6-month and 1-year compressive strength tests are waived. The use of the admixture is at the option of the Contractor and may only be used for fixed form placement method. Retarder may not be used for slipform placing method.

2.2.3 Water-Reducer

A water-reducing admixture shall meet the requirements of ASTM C 494, Type A except that the 6-month and 1-year compressive strength tests are waived. The admixture may be added to the concrete mixture only when its use is approved or directed. A type D admixture shall not be used in mixes used for slip-form paving.

2.3 CEMENTITIOUS MATERIALS

2.3.1 Cement

Cement shall be portland cement conforming to ASTM C 150, Type II, Low Alkali Cement. The physical requirements for false set shall apply.

2.3.2 Portland-Pozzolan Cement

Portland-pozzolan cement shall conform to the requirements of ASTM C 595, Type IP, but shall meet the volume requirements noted in the last sentence of paragraph 1.6.1 Mixture Proportioning.

2.3.3 Pozzolan

Pozzolan shall conform to ASTM C 618, Class F. Supplementary physical requirements in Table 1A & 2A shall apply including reactivity with alkalis. Maximum loss on ignition for pozzolan shown in Table 1 of ASTM C 618 shall be 3.0 percent.

2.4 CURING MATERIALS

Curing materials shall conform to the following:

- a. White burlap-polyethylene sheet shall conform to ASTM C 171.
- b. Membrane curing compound shall be a pigmented type conforming to Corps of Engineers Specification CRD-C 300.

2.5 DOWELS

Dowels shall be plain steel bars conforming to ASTM A 675, grade 80, and of the sizes and dimensions indicated.

2.6 JOINT FILLER

2.6.1 For Expansion Joints

Filler shall be preformed materials conforming to ASTM D 1751 or ASTM D 1752.

2.6.2 For Contraction Joints

Sewable type contraction joint inserts shall conform to ASTM D 2828.

2.7 REINFORCEMENT

All reinforcement shall be free from loose flaky rust, loose scale, oil, grease, mud, or other coatings that might reduce and bond with concrete.

2.7.1 Bar mats

Bar mat shall conform to ASTM A 184

2.7.2 Reinforcing bars

Reinforcing bars shall conform to ASTM A 615, grade 40

2.8 WATER

Water for washing aggregate and for mixing and curing concrete shall be

fresh and free from injurious amounts of oil, acid, salt, alkali, organic matter, or other deleterious substances.

2.9 EPOXY RESIN

Epoxy resin shall conform to ASTM C 881.

PART 3 EXECUTION

3.1 SUBGRADE, BASE, FORMS, AND STRINGLINE

3.1.1 Underlying Material

The prepared surface of the subgrade or base course material shall be kept free of foreign matter, waste concrete and/or cement, and debris at all times and shall be thoroughly wetted down sufficiently in advance to insure a firm, moist condition when the concrete is placed. In cold weather the underlying material shall be prepared and so protected that it will be entirely free from frost when the concrete is placed. The use of chemicals to eliminate frost in the underlying material will not be permitted. Crossing of the prepared subgrade at specified intervals for construction purposes may be permitted for any type of subgrade, provided rutting or indentations do not occur. If traffic has been allowed to use the prepared subgrade, the surface shall be checked and corrected before concrete is placed.

3.1.2 Forms

Forms shall be of steel, except that wood forms may be used on curves having a radius of 45 meters or less, and for fillets. Forms shall be equal in depth to the edge thickness of the slab as shown, and shall not be built up except as permitted below. When the project required several different slab thicknesses, forms may be built up with metal or wood to provide an increase in depth of not more than 25 percent.

3.1.2.1 Steel Forms

Steel forms shall be furnished in sections not less than 3 meter in length, except that on curves having a radius of 45 meters or less, the length of the sections shall be five feet unless the sections are flexible or curved to the proper radius. The top surface of a form shall vary not more than 3 mm in 3 meter from a true line. The face of the form shall vary not more than 6 mm in 3 meter from a true plan. Forms with battered top surfaces, warps, bends, kinks, or distorted faces or bases shall be removed from the project.

3.1.2.2 Wood Forms

Wood forms for curves and fillets shall be made of well-seasoned surfaced plank or plywood, straight, and free from warp or bend. Wood forms shall be adequate in strength and rigidly braced.

3.1.3 Form Setting

The forms shall be set on firm material cut true to grade so that each form section when placed will be firmly in contact with the underlying layer for its entire length and base width. The length of pins and quantity provided in each section shall be sufficient to hold the form at the correct line

and grade. When tested by a 3.7-meters straight-edge, the top of the form shall conform to the requirements specified for the finished surface of the concrete. Forms shall be set well in advance of concrete placement. They shall be cleaned and oiled each time before concrete is placed.

3.1.4 Stringline

Stringline shall be accurately and securely installed well in advance of concrete placement. Staked supports shall be placed at intervals to eliminate sag with the stringline is tightened. The stringline shall be high strength wire that will allow sufficient tension to be applied to remove sag between supports. The stringline at the supports shall be easily adjusted in both the horizontal and vertical directions. When necessary to leave gaps in the stringline, supports on either side of the gap shall be secured to avoid disturbing the remainder of the stringline when the portion across the gap is positioned and tightened. Vertical and horizontal positioning of the stringline shall be such that the finished pavement shall conform to the alinement and grade elevations shown.

3.1.5 BATCHING, MIXING AND TRANSPORTATION

3.1.5.1 Type of Plant

The Contractor shall provide semiautomatic or automatic concrete plant conforming to the applicable requirements of ASTM C 94, except as specified below. The concrete plant may be located on or off the Government premises as approved.

3.1.5.1.1 Scales

The Contractor shall provide standard test weights and any other auxiliary equipment required for checking the operating performance of each scale or other measuring device. Periodic tests shall be made when and as directed, in the presence of the Contracting Officer. Upon completion of each check test and before further use of the indicating, or control devices, such adjustments, repairs, or replacements shall be made as required to secure satisfactory performance.

3.2 Protection

Weighing, indicating, recording and control equipment shall be protected against exposure to dust and weather.

3.3 Concrete Mixers

3.3.1 General Requirements

The mixing time will be increased when necessary to secure the required uniformity and consistency of the concrete. Excessive overmixing requiring additions of water will not be permitted. The mixers shall be maintained in satisfactory operating condition, and mixer drums shall be kept free of hardened concrete. Mixer blades shall be replaced when worn down more than 10 percent of their original depth. The use of a mixer that at any time produces unsatisfactory results shall be promptly discontinued until repaired.

3.3.2 Truck Mixers

Truck mixers shall be used for fixed form placement. Transportation of

concrete batched at a batch plant shall be transported to the point of placement by truck agitator or truck mixer. Truck mixers, the mixing of concrete therein, and concrete uniformity, shall conform to the requirements of ASTM C 94. A truck mixer may be used either for complete mixing (transit mixing) or to finish the partial mixing done in a stationary mixer (shrink-mixed). Each truck shall be equipped with two counters from which it will be possible to determine the number of revolutions at mixing speed and the number of revolutions at agitating speed.

3.4 Transportation Equipment

All transporting equipment shall conform to ASTM C 94 except as modified herein. Vehicles and equipment transporting concrete shall be capable of delivering and discharging the concrete without segregation. The transfer and distribution of the concrete from vehicles shall be by mechanical spreader, or concrete bucket and crane.

3.5 PLACING

3.5.1 General

Concrete shall be placed between stationary forms. When concrete is truck mixed or when a truck mixer or a agitator is used for transporting concrete, the concrete shall be deposited between the stationary forms within 1-1/2 hours from the time the cement is introduced to the aggregates. When the length of haul makes it impossible to deliver truck mixed concrete within these time limits, batching of cement and a portion of the mixing water shall be delayed until the truck mixer is at or near the construction site. At no case shall the water cement ratio of the proposed mix be exceeded by the addition of extra mixing water. Concrete shall be deposited as close as possible to its final position in the pavement cross section.

3.5.2 Placing Reinforcing Steel

The type and amount of steel reinforcement shall be as shown on the drawings. For pavement thickness of 305 mm or more, the reinforcement steel shall be installed by the strike-off method wherein the concrete is deposited on the underlying material, consolidated and struck to the indicated elevation of the steel reinforcement. The reinforcement shall be laid upon the prestruck surface, and the remaining concrete shall then be placed and finished in the required manner. Any portions of the bottom layer of concrete that have been placed more than 30 minutes without being covered with the top layer shall be removed and replaced with newly mixed concrete without additional cost to the Government. For pavements less than 305 mm thick, the reinforcement may be positioned on suitable chairs prior to concrete placement.

3.5.3 Placement During Cold Weather

Concrete placement shall be discontinued when the air temperature reaches 4 degrees C and is falling and shall not be resumed until the air temperature reaches 2 degrees C and is rising. Provision shall be made to protect the concrete from freezing during the specified curing period. Concrete damaged by freezing shall be removed and replaced in conformance with Paragraph: REMOVAL AND REPLACEMENT OF DEFECTIVE PAVEMENT AREAS below.

3.5.4 Placing During Warm Weather

During periods of warm weather when the maximum daily air temperature is likely to exceed 29 degrees C, the following precautions shall be taken. The forms shall be sprinkled with water immediately before placing the concrete. The concrete temperature shall not exceed 32 degrees C when placed. The aggregates and/or mixing water shall be cooled as necessary.

3.6 FIELD TEST SPECIMENS

3.6.1 General

Concrete samples shall be furnished by the Contractor, and shall be taken in the field by the Contractor at his expense to determine the slump, air content, and strength of the concrete. Cylinders will be made for determining conformance with the strength requirements of these specifications and, when required, for determining the time at which pavements may be placed in service. The air content will be determined in conformance with ASTM C 231. Test cylinders shall be molded and cured in conformance with ASTM C 31. The Contractor shall furnish all materials, labor and facilities required for molding, curing, and protecting test cylinders at the site and under the supervision of the Contracting Officer.

3.6.2 Specimens for Strength Tests

Compressive strength cylinders shall be made each shift that concrete is placed. Each group of cylinders shall be molded from the same batch of concrete, and shall consist of a sufficient number of specimens to provide two tests at each test age. One group of specimens shall be made during each shift. However, at the start of paving operations and when the aggregate source, aggregate characteristics, or mix design is changed, additional groups of test cylinders may be required until the Contracting Officer is satisfied that the concrete mixture being used complies with the strength requirements of these specifications. Test ages shall be 7 days and 28 days.

3.7 FINISHING

Finishing operations shall be started immediately after concrete placement. Finishing shall be by the machine method except that where so indicated, the hand method will be permitted on odd slab widths or shapes and in event of breakdown of the mechanical equipment to finish concrete. The sequence of operations shall be as follows: screeding, consolidation, floating, straight edging, and texturing.

3.7.1 Machine Finishing - Fixed Forms

3.7.1.1 Equipment

The finishing machine shall be operated to strike-off screed, and consolidate the concrete. Machines that cause displacement of side forms or that cause frequent delays due to mechanical failure shall be replaced. Finishing machines riding the edge of a previously constructed slab shall be made to protect the surface to these slabs.

3.7.1.2 Finishing

The finishing machine shall make as many trips over each area of pavement as necessary to compact the concrete and produce a surface of uniform texture, true to grade. However, excessive manipulation that brings to the

surface an excess of mortar and water will not be permitted, and any equipment that cannot produce the required compaction and surface finish without an excessive number of trips will be considered unsatisfactory. The top of the form or pavement edge upon which the finishing machine travels shall be kept clean.

3.7.1.3 Mechanical Floating

After completion of finishing, the mechanical float shall be operated to smooth and finish the pavement to grade. If required, additional concrete shall be placed and screeded, and the float operated over the same area until a satisfactory surface is produced.

3.7.1.4 Other Types of Finishing Equipment

Concrete finishing equipment of types other than specified above may be used on a trial basis. The use of equipment that fails to produce finished concrete of the quality and consistency required by these specifications shall be discontinued, and the concrete shall be finished with approved equipment and in the manner specified above.

3.7.2 Hand Finishing

3.7.2.1 Equipment

Vibrators, a strike template, and a longitudinal float shall be provided for hand finishing. The template shall be at least 305 mm longer than the width of pavement being finished and shall be of an approved design, sufficiently rigid to retain its shape, and constructed of metal or other suitable material shod with metal. The longitudinal float shall be at least 3 meters long, of approved design, rigid and substantially braced and shall maintain a plane surface on the bottom of the base.

3.7.2.2 Finishing and Floating

After vibration, the concrete shall be struck off and screeded to the crown, cross section, and elevation required. If necessary, additional concrete shall be placed and screeded, and the float operated until a satisfactory surface has been produced.

3.7.3 Surface Correction and Testing

After transverse finishing is completed but while the concrete is still plastic, the surface shall then be tested for trueness with a 3.7 meters straightedge held in successive positions parallel and at right angles to the centerline of the pavement, and the whole area covered as necessary to detect variations. The straightedge shall be advanced along the pavement in successive stages. Depressions shall be immediately filled with freshly mixed concrete, struck off, consolidated, and refinished. Projections above the required elevation shall also be struck off and refinished. The straightedge testing and finishing shall continue until the entire surface of the concrete is free from observable departure from the straightedge and conform to the surface requirements specified under subparagraph: "Surface Smoothness" below.

3.7.4 Texturing

Before the surface sheen has disappeared and before the concrete becomes nonplastic, the surface of the pavement shall be given the texture as

described below.

3.7.4.1 Burlap-Drag Texture

Surface texture shall be applied by dragging the surface of the pavement, in the direction of the concrete placement, with an approved multiple-ply burlap drag at least 0.9 meter in width and equal in length to the width of the slab. The leading transverse edge of the drag shall be securely fastened to a lightweight pole or traveling bridge, and at least 305 mm of the burlap shall be in contact with the pavement during dragging operation.

The drag shall be operated with the burlap moist and the burlap shall be cleaned and changed as required. The dragging shall be done so as to produce a uniform finished surface having a fine sandy texture without disfiguring marks.

3.7.5 Edging

After texturing has been completed, the edge of slabs along the forms, where indicated or directed, shall be carefully finished with an edging tool to form a smooth surface of the required radius. Tool marks shall be eliminated, and the edges shall be smooth and true to line. No edging shall be performed on the edges of slipformed lanes.

3.7.6 Outlets in Pavement

Recesses for the tie down anchors and other outlets in the pavement shall be constructed to conform to the details and dimensions shown. The concrete in these areas shall be carefully finished to provide a surface of the same texture as the surrounding area that will be within the requirements of PLAN GRADE AND SURFACE-SMOOTHNESS REQUIREMENTS below.

3.8 CURING

3.8.1 General

Concrete shall be protected against loss of moisture and rapid temperature changes for at least seven days from the beginning of the curing operation.

Unhardened concrete shall be protected from rain and flowing water. All equipment needed for adequate curing and protection of the concrete shall be on hand and ready to install before actual concrete placement begins. If any selected method of curing does not afford the proper curing and protection against concrete cracking, the damaged pavement will be removed and replaced and another method of curing shall be employed as directed.

3.8.2 Curing Procedures

Concrete curing shall be continued for the duration of the required curing period by the following method.

3.8.2.1 White Burlap-polyethylene Sheet

White burlap-polyethylene covers shall be at least 305 mm longer than necessary to cover the entire width and edge of the pavement lane. Adjacent mats shall overlap at least 152 mm. The mats shall be thoroughly wetted before placing and shall be kept continuously wet and in intimate contact with the pavement edges and surface for the duration of the required curing period.

3.8.2.2 Membrane Curing

A uniform coating of white pigmented membrane curing compound shall be applied to the entire exposed surface of the concrete as soon after finishing as free water has disappeared from the finished surface. Formed surfaces shall be coated immediately after the forms are removed and in no case longer than one hour after removal of forms. The concrete shall not be allowed to dry before the application of the membrane. If any drying has occurred, the surface of the concrete shall be moistened with a fine spray of water, and the curing compound applied as soon as the free water disappears. The curing compound shall be applied to the finished surfaces by means of an approved multiple nozzle automatic spraying machine. The curing compound in the drum used for the spraying operation shall be thoroughly and continuously agitated mechanically throughout the full depth of the drum during the application. The curing compound shall be applied with a coverage rate of not more than 4.9 meters square per liter. The application of curing compound by hand-operated pressure sprayers will be permitted only on odd widths or shapes of slabs where indicated, and on concrete surfaces exposed by the removal of forms. Concrete surfaces that are subjected to heavy rainfall within three hours after the curing compound has been applied shall be resprayed by the method and at the coverage specified above. Areas where the curing compound is damaged by subsequent construction operations within the curing period shall be resprayed.

3.9 FORM REMOVAL

Forms shall remain in place at least 12 hours after the concrete has been placed. When conditions are such that the early-strength gain of the concrete is delayed, the forms shall be left in place for a longer period as directed. Forms shall be removed without injuring the concrete. Any concrete found defective after form removal shall be satisfactorily repaired promptly.

3.10 PLAN GRADE AND SURFACE-SMOOTHNESS REQUIREMENTS

The finished surfaces of airfield and heliport pavement, when tested as specified below in SURFACE TESTS, DEFICIENCIES, AND CORRECTIONS, shall conform to the grade line and elevations shown and the surface-smoothness requirements specified herein.

3.10.1 Plan Grade

The finished surfaces of the pavement shall conform, within the tolerances shown in Table 1, to the lines, grades, and cross sections shown. The finished surface of the pavements shall vary not more than 12.7 mm above or below the plan grade line or elevation established and approved at the jobsite in accordance with GRADE CONTROL above. However, the above 12.7 mm deviation from the approved grade line and elevation will not be permitted in areas where closer conformance with planned grade and elevation is required for the proper functioning of appurtenant structures. The finished surfaces of new abutting pavements shall coincide at their juncture. Where a new pavement abuts an existing pavement, transition pavement strip of the type and dimensions indicated shall be installed.

3.10.2 Surface Smoothness

The finished surface of pavements shall have no abrupt change of 3.2 mm or more and shall not deviate from the testing edge of an approved 3.7 m straightedge more than the tolerances shown for the respective pavement

category in Table 1 below:

TABLE 1

Item No.	Pavement Category	Direction of Testing	Tolerances
1.	All paved areas	Longitudinal	6.4 mm
		Transverse	6.4 mm

3.11 SURFACE TESTS, DEFICIENCIES AND CORRECTIONS

The finished surface of each pavement category of the contract shall be tested for conformance with the respective requirements of PLAN GRADE AND SURFACE-SMOOTHNESS REQUIREMENTS above.

3.11.1 Equipment

The Contractor shall furnish and maintain at the jobsite in good condition, one 3.7 m straightedge for each paving spread for use in testing the fresh and hardened portland-cement concrete surfaces. These straightedges shall be constructed of aluminum or magnesium alloy and shall have blades of box or box-girder cross section with flat bottom, adequately reinforced to insure rigidity and accuracy. Straightedges shall have handles for operation on the pavement.

3.11.2 Grade Conformance Tests

Each pavement category will be checked for conformance with subparagraph Plan Grade above. The finished surface will be treated by the Contracting Officer by running lines of levels at intervals of 7.6 m or less apart longitudinally and transversely to determine the elevation of the completed pavement. Within 30 days after the completion of concrete placement in the respective pavement areas, the Contracting Officer will inform the Contractor in writing of all areas defective in plan-grade requirements.

3.11.3 Surface-smoothness Determinations

After the concrete has hardened sufficiently to permit walking thereon, but not later than 36 hours after placement, the surface of the pavement shall be tested by the Contractor with a 3.7 m straightedge or other approved device, operated in such manner as to reveal all surface irregularities exceeding the tolerances specified in Table 1 above, except that deviations from the approved straightedge greater than specified tolerances caused by edge slump along slip formed longitudinal construction joints shall not be considered in smoothness determinations in the transverse direction. Deviations greater than specified tolerances caused by high areas along slipformed longitudinal construction joints shall be considered in smoothness determination in the transverse direction. The entire area of the pavement shall be tested in both a longitudinal and transverse direction on parallel lines ten feet or less apart. The straightedge shall be held in contact with the surface and moved ahead one-half the length of the straightedge for each successive measurement. Straightedge lines shall be carried continuously across joints. Other devices that reveal surface irregularities exceeding specified tolerances may be used when approved. Straightedge testing for acceptance or rejection of the finished pavement surface will be performed by the Contracting Officer as soon as possible and not later than 48 hours after the end of the curing period, except that straightedge testing across longitudinal construction joints will be accomplished with 48 hours after the end of the curing period of the

concrete placed in the adjacent lane.

3.11.4 Deficiencies and Corrections

High areas shall be reduced either by rubbing the freshly finished concrete with carborundum brick and water when the concrete is less than 36 hours old or by grinding the hardened concrete with an approved surface grinding machine when the concrete is older than 36 hours. The area corrected by grinding the hardened surface shall not exceed 5 percent of the area of any integral slab and the depth of grinding shall not exceed 63 mm. All pavement areas requiring plan grade, surface smoothness or edge slump corrections in excess of the limits specified above, shall be removed and replaced in conformance with Paragraph: REMOVAL AND REPLACEMENT OF DEFECTIVE PAVEMENT AREAS. Areas exceeding 2.3 square meter that have been corrected by rubbing or grinding will be retextured by transverse grooving.

The grooves shall be 3.2 to 6.4 mm on 50.8 mm centers and shall be carried into, and tapered to zero depth within the non-corrected surface. All areas in which rubbing or grinding has been performed will be subject to the thickness tolerances specified in Paragraph: TOLERANCE IN PAVEMENT THICKNESS.

3.12 TOLERANCES IN PAVEMENT THICKNESS

Pavements shall be of the thicknesses indicated on the plans. Deficiencies in the thickness shall be treated as described below. Testing shall be the responsibility of the Contractor and shall be performed by an approved commercial testing laboratory at no additional cost to the Government.

3.12.1 Thickness Determination

The thickness of the pavement shall be determined on the basis of measurements made on cores drilled from points in the pavement, within seven days after placement of the concrete. Cores generally shall be taken from every other lane of the paved area or as directed by the Contracting Officer. Measurement of individual cores shall be performed in accordance with ASTM C 174. The core holes shall be refilled by the Contractor with portland cement concrete bonded to the pavement with epoxy-resin grout.

3.12.2 Permissible Deficiency

Permissible deficiency in pavement thickness will be up to but not including 6.4 mm of the specified thickness.

3.12.2.1 Pavement Deficient in Thickness

When measurement of any core indicates that the pavement is deficient in thickness 6.4 mm or more, additional cores shall be drilled at 7.6 meters intervals along the center line of the lane on each side of the deficient core, until the cores indicate that the deficiency in thickness is less than 6.4 mm. Pavement areas deficient in slab thickness 6.4 mm or more shall be removed or replaced with pavement of the indicated thickness in conformance with Paragraph: REMOVAL AND REPLACEMENT OF DEFECTIVE PAVEMENT AREAS. Partial slabs to be removed and replaced shall extend across the full paving lane width midway between adjacent cores or to the regularly scheduled transverse joint should such a joint fall between the cores. If the Contractor believes that the cores and measurement taken are not sufficient to indicate fairly the actual thickness of the pavement, additional cores and measurements will be taken provided the Contractor will bear the extra cost of drilling the cores and filling the holes in the

pavement as directed. When surface grinding and texture restoration is required that results in thickness deficiencies which exceed the permissible deviations, the concrete removal and replacement requirements will apply as contained in Paragraph: REMOVAL AND REPLACEMENT OF DEFECTIVE PAVEMENT AREAS.

3.13 REPAIRS OF DEFECTIVE PAVEMENT SLABS

Broken slabs, random cracks, nonworking contraction joints near cracks, and spalls along joints and cracks shall be replaced or repaired as specified below. The Contracting Officer will be responsible for determining, by means of a structural evaluation, whether defective pavement shall be repaired as specified below or replaced as specified in Paragraph: REMOVAL AND REPLACEMENT OF DEFECTIVE PAVEMENT AREAS.

3.13.1 Spalls

Spalls along joints or at other locations shall be repaired as specified in TM 5-822-9 at no additional cost to the Government.

3.13.2 Broken Slabs

Broken slabs and random cracks shall be repaired by pressure epoxy-grout injection as specified hereinafter at no additional cost to the Government.

3.13.2.1 Materials

Epoxy-resin based binder shall be two-component material formulated to meet the requirements of ASTM C 881, Type I, Grade I, Class determined by ambient temperature. Epoxy grout mixture shall be in accordance with manufacturer's recommendations for each particular area to be repaired.

3.13.2.2 Epoxy Injection

3.13.2.2.1 Preparation of Crack Area

Remove all surface contamination by wire brushing, scraping or light sandblasting and remove dust in crack with light air jet. After approval of the preparation operation, the Contractor shall apply a seal to the surface of the crack, leaving ports for injection of epoxy material in accordance with the manufacturer's recommendations. After epoxy injection, the Contractor shall deepen the adjacent sawed joint to at least 1/3 the pavement thickness.

3.14 Epoxy Injection Placement

The Contractor shall perform the necessary drilling and grouting at all random cracks which develop. The epoxy material shall be proportioned and injected as recommended by the manufacturer of the material for the intended use. The concrete cracks shall be mapped and the injection shall be on center-to-center spacing necessary to perform structural bonding to the full depth of the crack. Epoxy injection of cracks shall not be started until the concrete has cured for a minimum of 7 days and the injection shall be completed within 14 days after placement.

3.15 REMOVAL AND REPLACEMENT OF DEFECTIVE PAVEMENT AREAS

Defective pavement shall be removed and replaced as specified herein with pavements of the thickness and quality required by these specifications.

In no case shall concrete removal and replacement result in a slab less than the full paving lane width or a joint less than 3 meters from a regularly scheduled transverse joint. When a portion of the unfractured slab is replaced, a saw cut three inches deep shall be made transversely across the slab in the required location, and the concrete shall be removed to provide an essentially vertical face in the remaining portion of the slab. Just prior to placement of concrete, the slab face shall be cleaned of debris and loose concrete, dust removed with light air jet, and then thoroughly coated with a thixotropic epoxy-resin adhesive manufactured specifically for bonding fresh portland cement concrete to existing hardened concrete. Longitudinal construction joints and transverse contraction joints shall not be coated with epoxy-resin adhesive. Asphaltic emulsion or other approved bond-breaking medium shall be pointed on vertical construction and contraction joint faces. Longitudinal and transverse joints of the replaced slab or portion thereof shall be constructed as indicated. The joints shall be sealed as specified in SECTION: JOINT SEALING IN CONCRETE PAVEMENTS. The replaced pavement will be paid for at the contract price but no payment will be made for the defective pavements removed nor for the cost of removing the defective pavements.

3.16 JOINTS

3.16.1 Longitudinal Construction Joints

Longitudinal construction joints between paving lanes shall be located as indicated. When the concrete is placed using stationary forms, metal forms securely fastened to the concrete form shall be used to form the keyway in the plastic concrete. Longitudinal construction joints shall be edged and subsequently sawed to provide a groove at the top conforming to the details and dimensions indicated.

3.16.2 Transverse Construction Joints

Transverse construction joints shall be installed at the end of each day's placing operations and at any other points within a paving lane when concrete placement is interrupted for 30 minutes or longer. Insofar as practicable, transverse construction joints shall be installed in the location of a planned joint. When concrete placement cannot be continued, the transverse construction joint may be installed within the slab unit but not less than 3 meters from a planned transverse joint. Transverse construction joints shall be doweled as shown. When the construction joint is located at planned transverse joints, one half of each dowel shall be painted and oiled to permit movement at the joint. These joints shall be edged and subsequently sawed to provide a groove at the top conforming to the details and dimensions indicated.

3.16.3 Expansion Joints

Expansion joints shall be formed by means of a preformed filler material. The filler shall be securely held in position by means of approved metal supports which shall remain in the pavement. A removable metal channel cap bar shall be used to hold the parts of the joint in proper position and protect the filler from damage during concreting operations. The cap bar shall be removable without damage to the pavement to provide a space for sealing of the joint. Expansion joints shall be formed about structures and features that project through, into, or against the pavement, using joint filler of the type, thickness, and width indicated, and installed in such manner as to form a complete, uniform separation between the structure

and pavement.

3.16.4 Contraction Joints

Transverse and longitudinal contraction joints shall be sawed and constructed as indicated. Longitudinal contraction joints shall be constructed by sawing a groove in the hardened concrete with a power-driven saw in conformance with subparagraph 3.12.4.1 below, unless otherwise approved. Transverse contraction joints shall be constructed in conformance with subparagraphs 3.12.4.1 or 3.12.4.2 below, unless otherwise approved.

3.16.4.1 Sawed Joints

Sawed joints shall be constructed by sawing a groove in the concrete with a 3.2 mm blade to the full depth as indicated. After expiration of the curing period, the upper portion of the groove shall be widened by sawing to the width and depth indicated. The time of sawing shall vary depending on existing and anticipated weather conditions, and shall be such as to prevent uncontrolled cracking of the pavement. Sawing of the joints shall commence as soon as the concrete has hardened sufficiently to permit cutting the concrete without chipping, spalling, or tearing. The sawed faces of joints will be inspected for undercutting or washing of the concrete due to the early sawing, and sawing shall be delayed if undercutting is sufficiently deep to cause structural weakness or excessive toughness in the joint. The sawing operation shall be carried on as required during both day and night regardless of weather conditions. The joints shall be sawed at the required spacing consecutively in the sequence of the concrete placement. The saw cut shall not vary more than 12.7 mm from the true joint alignment. Before sawing a joint, the concrete shall be examined closely for cracks, and the joint shall not be sawed if a crack has occurred near the joint location. Sawing shall be discontinued when a crack develops ahead of the saw cut. Immediately after joint is sawed, the saw cut and adjacent concrete surface shall be thoroughly flushed with water until all waste from sawing is removed from the joint. Any membrane-cured surface damaged during the sawing operations shall be resprayed as soon as the surface becomes dry. An ample supply of saw blades shall be available on the job before concrete placement is started, and at least one standby sawing unit in good working order shall be available at the jobsite at all times during the sawing operation.

3.16.5 Dowels

3.16.5.1 Fixed Form Installation

Fixed form installation of dowels shall be prepared and placed across joints where indicated, correctly aligned and securely held in the proper horizontal and vertical position during placing and finishing operations. Installation by removing and replacing dowels in preformed holes will not be permitted. Dowels in longitudinal and transverse construction joints shall be held securely in place parallel to the surface as indicated, by means of devices fastened to the form. Dowels in longitudinal joints shall be omitted when the center of the dowel would be located within a horizontal distance from a transverse joint equal to 1/4 of slab thickness.

Dowels shall be installed within 3.2 mm per meter of length of correct alignment. The Contractor shall furnish as approved template for checking the position of the dowels. The portion of each dowel intended to move within the concrete or expansion cap shall be painted with one coat of red-lead or blue-lead paint. The painted portion shall be wiped clean and

coated with a film of lubricating oil before concrete is placed.

3.16.6 Sealed Joints

Joints shall be sealed immediately following curing of the concrete or as soon thereafter as weather conditions permit, as directed. Joints shall be sealed as specified in SECTION: JOINT SEALING IN CONCRETE PAVEMENTS.

3.17 PAVEMENT PROTECTION

The Contractor shall protect the pavement against all damage prior to final acceptance of the work by the Government. Traffic shall be excluded from the pavement until the concrete is at least 14 days old, or for a longer period if so directed. As a construction expedient in paving intermediate lanes between newly paved lanes, operation of the paver and batch-hauling equipment will be permitted on the pavement after the pavement has been cured for seven days and the joints have been sealed or otherwise protected. Also, the subgrade planer, a concrete finishing machine, and similar equipment may be permitted to ride upon the edges of previously constructed slabs when the concrete has attained a minimum flexural strength of 2.8 Mpa, and provided further that adequate means are furnished to prevent damage to the slab edge.

3.18 CONTRACTOR QUALITY CONTROL

3.18.1 General

The Contractor shall perform the inspection and tests described above and in Paragraph: INSPECTION DETAILS AND FREQUENCY OF TESTING. All testing shall be accomplished by use of the Contractor's own laboratory or by using the services of a commercial laboratory approved by the Contracting Officer. The Government reserves the right to check laboratory equipment employed for compliance with the test standards, and the right to sample and test materials at any time.

3.18.2 Inspection Details and Frequency of Testing

3.18.2.1 Fine Aggregate

3.18.2.1.1 Grading

During each shift when the concrete plant is operating there shall be one sieve analysis in accordance with ASTM C 136 for the fine aggregate.

3.19 Moisture Content

Two tests for moisture content in accordance with ASTM C 70 and ASTM C 566 will be made during each shift of mixing plant operation. An additional test shall be made whenever the slump is shown to be out of control or excessive variation in workability is reported by the placing foreman.

3.20 Coarse Aggregate

During each shift in which concrete plant is operating there shall be a sieve analysis in accordance with ASTM C 136 for each size of coarse aggregate. Samples shall be taken from the batch plant bins.

3.21 Deleterious Materials

During each shift there shall be one petrographic examination for deleterious materials made in accordance with the applicable provisions of ASTM C 295 and the requirements herein before stated, of each size of coarse aggregate. Samples shall be taken from the batch plant bins. Frequency of testing may be reduced as approved following tests that meet requirements stated for 5 shifts of concrete placement.

3.22 Scales

The accuracy of the scales shall be checked by test weights as directed by the Contracting Officer, for conformance with the applicable requirements of NBS H44. Once a week the accuracy of each batching device shall be checked during a weighing operation by noting and recording the required weight, and the actual weight batched.

3.23 Batch-Plant Control

When the concrete plant is operating, the measurement of all constituent materials including cement, each size of aggregate, water and admixtures shall be continuously monitored. The aggregate weights and amount of water subtracted to compensate for free moisture in the aggregates shall be adjusted as necessary. The amount of air-entraining agent shall be adjusted to control air content within specified limits. A report shall be prepared indicating type and source of cement used, amount and source of admixtures used, aggregate source, the required aggregate and water weights per cubic meter, amount of water as free moisture in each size of aggregate and the batched aggregate and water weights per cubic yard for each class of concrete batched during plant operation.

3.24 Concrete

3.24.1 Air Content Tests

Two tests for air content shall be made on randomly selected batches of concrete during each shift of concrete production. Additional tests shall be made when excessive variation in workability is reported by the placing foreman or Government inspector. Tests shall be made in accordance with ASTM C 231.

3.24.2 Slump Tests

A minimum of two slump tests shall be made on randomly selected batches of each class of concrete during each 8 hour period of concrete production in accordance with ASTM C 143. Additional tests shall be made when excessive variations in workability is reported by the placing foreman or Government inspector.

3.24.3 Test Cylinders

A minimum of one set of four cylinders shall be made for each shift of concrete placement. However, at the start of paving operations and when the aggregate source, aggregate characteristics, or mix proportioning is changed, additional sets may be required until the Contracting Officer is satisfied that the concrete mixture being used complies with the strength requirements of these specifications. Test cylinders shall be tested in pairs at 7 days and 28 days of age. One slump and air content test of those herein before specified shall be taken with each set of cylinders. Concrete samples shall be secured in conformance with ASTM C 31, except that the use of cardboard molds will not be permitted.

3.25 Curing

No curing compound shall be applied until the Contractor has verified that the compound is properly mixed and ready for spraying. At the end of each shift the Contractor shall determine the quantity of compound used and the area of concrete surface covered and compute the rate of coverage in meter per liter, noting whether coverage is uniform.

3.26 Reports

All results of tests conducted at the project site shall be reported in accordance with SECTION: CONSTRUCTION QUALITY CONTROL.

3.27 CONSTRUCTION QUALITY CONTROL

Attention is directed to SECTION: CONSTRUCTION QUALITY CONTROL which requires the Contractor to perform quality control inspection, testing, and reporting.

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SECTION 03100

STRUCTURAL CONCRETE FORMWORK

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN CONCRETE INSTITUTE (ACI)

ACI 347R (1988) Guide to Formwork for Concrete

AMERICAN HARDBOARD ASSOCIATION (AHA)

AHA A135.4 (1982; R 1988) Basic Hardboard

DEPARTMENT OF COMMERCE (DOC)

DOC PS 1 (1983) Construction and Industrial Plywood

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL PROCEDURES:

SD-01 Data

Design; GA.

Design analysis and calculations for form design and methodology used in the design.

Concrete Formwork; GA.

Manufacturer's data including literature describing form materials, accessories, and form releasing agents.

SD-04 Drawings

Concrete Formwork; GA.

Drawings showing details of formwork including, joints, supports, studding and shoring, and sequence of form and shoring removal.

SD-06 Instructions

Form Releasing Agents; FIO.

Manufacturer's recommendation on method and rate of application of form releasing agents.

1.3 DESIGN

Formwork shall be designed in accordance with methodology of ACI 347R for anticipated loads, lateral pressures, and stresses. Forms shall be capable of producing a surface which meets the requirements of the class of finish specified in Section 03300 CONCRETE FOR BUILDING CONSTRUCTION. Forms shall be capable of withstanding the pressures resulting from placement and vibration of concrete.

PART 2 PRODUCTS

2.1 FORM MATERIALS

2.1.1 Forms For Class B Finish

Forms for Class B finished surfaces shall be plywood panels conforming to DOC PS 1, Grade B-B concrete form panels, Class I or II. Other form materials or liners may be used provided the smoothness and appearance of concrete produced will be equivalent to that produced by the plywood concrete form panels. Forms for round columns shall be the prefabricated seamless type.

2.1.2 Forms For Class C Finish

Forms for Class C finished surfaces shall be shiplap lumber; plywood conforming to DOC PS 1, Grade B-B concrete form panels, Class I or II; tempered concrete form hardboard conforming to AHA A135.4; other approved concrete form material; or steel, except that steel lining on wood sheathing shall not be used. Forms for round columns may have one vertical seam.

2.1.3 Forms For Class D Finish

Forms for Class D finished surfaces, except where concrete is placed against earth, shall be wood or steel or other approved concrete form material.

2.1.4 Retain-In-Place Metal Forms

Retain-in-place metal forms for concrete slabs and roofs shall be as specified in Section 05300 STEEL DECKING.

2.1.5 Form Ties

Form ties shall be factory-fabricated metal ties, shall be of the removable or internal disconnecting or snap-off type, and shall be of a design that will not permit form deflection and will not spall concrete upon removal. Solid backing shall be provided for each tie. Except where removable tie rods are used, ties shall not leave holes in the concrete surface less than 6 mm nor more than 25 mm deep and not more than 25 mm in diameter. Removable tie rods shall be not more than 38 mm in diameter.

2.1.6 Form Releasing Agents

Form releasing agents shall be commercial formulations that will not bond with, stain or adversely affect concrete surfaces. Agents shall not impair subsequent treatment of concrete surfaces depending upon bond or adhesion nor impede the wetting of surfaces to be cured with water or curing compounds.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Formwork

Forms shall be mortar tight, properly aligned and adequately supported to produce concrete surfaces meeting the surface requirements specified in Section 03300 CONCRETE FOR BUILDING CONSTRUCTION and conforming to construction tolerance given in TABLE 1. Where concrete surfaces are to have a Class A or Class B finish, joints in form panels shall be arranged as approved. Where forms for continuous surfaces are placed in successive units, care shall be taken to fit the forms over the completed surface so as to obtain accurate alignment of the surface and to prevent leakage of mortar. Forms shall not be reused if there is any evidence of surface wear and tear or defects which would impair the quality of the surface. Surfaces of forms to be reused shall be cleaned of mortar from previous concreting and of all other foreign material before reuse. Form ties that are to be completely withdrawn shall be coated with a nonstaining bond breaker.

3.2 CHAMFERING

Except as otherwise shown, external corners that will be exposed shall be chamfered, beveled, or rounded by moldings placed in the forms.

3.3 COATING

Forms for Class A and Class B finished surfaces shall be coated with a form releasing agent before the form or reinforcement is placed in final position. The coating shall be used as recommended in the manufacturer's printed or written instructions. Forms for Class C and D finished surfaces may be wet with water in lieu of coating immediately before placing concrete, except that in cold weather with probable freezing temperatures coating shall be mandatory. Surplus coating on form surfaces and coating on reinforcing steel and construction joints shall be removed before placing concrete.

3.4 REMOVAL OF FORMS

Forms shall be removed in a manner that will prevent injury to the concrete and ensure the complete safety of the structure. Formwork for columns, walls, side of beams and other parts not supporting the weight of concrete may be removed when the concrete has attained sufficient strength to resist damage from the removal operation but not before at least 24 hours has elapsed since concrete placement. Supporting forms and shores shall not be removed from beams, floors and walls until the structural units are strong enough to carry their own weight and any other construction or natural loads. In no case will supporting forms or shores be removed before the concrete strength has reached 70 percent of design strengths as determined

by field cured cylinders or other approved methods. This strength shall be demonstrated by job-cured test specimens, and by a structural analysis considering the proposed loads in relation to these test strengths and the strength of forming and shoring system. The job-cured test specimens for form removal purposes shall be provided in numbers as directed and shall be in addition to those required for concrete quality control. The specimens shall be removed from molds at the age of 24 hours and shall receive, insofar as possible, the same curing and protection as the structures they represent.

TABLE 1

TOLERANCES FOR FORMED SURFACES

1. Variations from the plumb:	In any 3 m of length -----6 mm
a. In the lines and surfaces of columns, piers, walls and in arises	Maximum for entire length ---25 mm
b. For exposed corner columns, control-joint grooves, and other conspicuous lines	In any 6 m of length -----6 mm Maximum for entire length ---13 mm
2. Variation from the level or from the grades indicated on the drawings:	In any 3 m of length -----6 mm In any bay or in any 6 m of length ----- 10 mm
a. In slab soffits, ceilings, beam soffits, and in arises, measured before removal of supporting shores	Maximum for entire length ---20 mm
b. In exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines	In any bay or in any 6 m of length - ----- 6 mm Maximum for entire length---13 mm
3. Variation of the linear building lines from established position in plan	In any 6 m -----13 mm Maximum -----25 mm
4. Variation of distance between walls, columns, partitions	6 mm per 3 m of distance, but not more than 13 mm in any one bay, and not more than 25 mm total variation
5. Variation in the sizes and locations of sleeves, floor openings, and wall opening	Minus ----- 6 mm Plus ----- 13 mm
6. Variation in cross-sectional dimensions of columns and beams and in the thickness	Minus ----- 6 mm Plus -----13 mm of slabs and walls
7. Footings:	

TABLE 1TOLERANCES FOR FORMED SURFACES

a. Variation of dimensions in plan	Minus -----	13 mm
	Plus -----	50 mm
	when formed or plus 75 mm when placed against unformed excavation	
b. Misplacement of eccentricity	2 percent of the footing width in the direction of misplacement but not more than -----	
		50 mm
c. Reduction in thickness	Minus -----	5 percent of specified thickness
8. Variation in steps:	Riser -----	3 mm
a. In a flight of stairs	Tread -----	6 mm
b. In consecutive steps	Riser -----	2 mm
	Tread -----	3 mm

3.5 CONSTRUCTION QUALITY CONTROL

Attention is directed to SECTION: CONSTRUCTION QUALITY CONTROL which requires the Contractor to perform quality control inspection, testing, and reporting.

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SECTION 03200

CONCRETE REINFORCEMENT

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ACI INTERNATIONAL (ACI)

ACI 318/318R	(1989; Rev 1992; Errata) Building Code Requirements for Reinforced Concrete
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AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 82	(1994) Steel Wire, Plain, for Concrete Reinforcement
ASTM A 184	(1990) Fabricated Deformed Steel Bar Mats for Concrete Reinforcement
ASTM A 615	(1995b) Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM A 706	(1993a) Low-Alloy Steel Deformed Bars for Concrete Reinforcement

AMERICAN WELDING SOCIETY (AWS)

AWS D1.4	(1992) Structural Welding Code - Reinforcing Steel
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CONCRETE REINFORCING STEEL INSTITUTE (CRSI)

CRSI MSP-1	(1990) Manual of Standard Practice
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1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL PROCEDURES:

SD-04 Drawings

Concrete Reinforcement System; GA

Detail drawings showing reinforcing steel schedules, sizes, grades, and splicing and bending details. Drawings shall show support details including types, sizes and spacing.

SD-08 Statements

Qualifications; FIO

A list of names of qualified welders.

SD-13 Certificates

Reinforcing Steel; GA

Certified copies of mill reports attesting that the reinforcing steel furnished meets the requirements specified, prior to the installation of reinforcing steel.

1.3 QUALIFICATIONS

Welders shall be qualified in accordance with AWS D1.4. Qualification test shall be performed at the worksite and the Contractor shall notify the Contracting Officer 24 hours prior to conducting tests. Special welding procedures and welders qualified by others may be accepted as permitted by AWS D1.4.

1.4 DELIVERY AND STORAGE

Reinforcement and accessories shall be stored off the ground on platforms, skids, or other supports.

PART 2 PRODUCTS

2.1 FABRICATED BAR MATS

Fabricated bar mats shall conform to ASTM A 184.

2.2 REINFORCING STEEL

Reinforcing steel shall be deformed bars conforming to ASTM A 615 or ASTM A 706, grade 60 and sizes as indicated. Cold drawn wire used for spiral reinforcement shall conform to ASTM A 82.

2.3 WIRE TIES

Wire ties shall be 16 gauge or heavier black annealed steel wire.

2.4 SUPPORTS

Bar supports for formed surfaces shall be designed and fabricated in accordance with CRSI MSP-1 and shall be steel or precast concrete blocks. Precast concrete blocks shall have wire ties and shall be not less than 100 by 100 mm (4 by 4 inches) when supporting reinforcement on ground. Precast concrete block shall have compressive strength equal to that of the surrounding concrete. Where concrete formed surfaces will be exposed to weather or where surfaces are to be painted, steel supports within 13 mm of concrete surface shall be galvanized, plastic protected or of stainless steel. Concrete supports used in concrete exposed to view shall have the same color and texture as the finish surface. For slabs on grade, supports shall be precast concrete blocks, plastic coated steel fabricated with bearing plates, or specifically designed wire-fabric supports fabricated of plastic.

PART 3 EXECUTION

3.1 REINFORCEMENT

Reinforcement shall be fabricated to shapes and dimensions shown and shall conform to the requirements of ACI 318/318R. Reinforcement shall be cold bent unless otherwise authorized. Bending may be accomplished in the field or at the mill. Bars shall not be bent after embedment in concrete. Safety caps shall be placed on all exposed ends of vertical concrete reinforcement bars that pose a danger to life safety. Wire tie ends shall face away from the forms.

3.1.1 Placement

Reinforcement shall be free from loose rust and scale, dirt, oil, or other deleterious coating that could reduce bond with the concrete. Reinforcement shall be placed in accordance with ACI 318/318R at locations shown plus or minus one bar diameter. Reinforcement shall not be continuous through expansion joints and shall be as indicated through construction or contraction joints. Concrete coverage shall be as indicated or as required by ACI 318/318R. If bars are moved more than one bar diameter to avoid interference with other reinforcement, conduits or embedded items, the resulting arrangement of bars, including additional bars required to meet structural requirements, shall be approved before concrete is placed.

3.1.2 Splicing

Splices of reinforcement shall conform to ACI 318/318R and shall be made only as required or indicated. Splicing shall be by lapping or by mechanical or welded butt connection; except that lap splices shall not be used for bars larger than No. 11 unless otherwise indicated. Welding shall conform to AWS D1.4. Welded butt splices shall be full penetration butt welds. Lapped bars shall be placed in contact and securely tied or spaced transversely apart to permit the embedment of the entire surface of each bar in concrete. Lapped bars shall not be spaced farther apart than one-fifth the required length of lap or 150 mm. Mechanical butt splices shall be in accordance with the recommendation of the manufacturer of the mechanical splicing device. Butt splices shall develop 125 percent of the specified minimum yield tensile strength of the spliced bars or of the smaller bar in transition splices. Bars shall be flame dried before butt splicing. Adequate jigs and clamps or other devices shall be provided to support, align, and hold the longitudinal centerline of the bars to be butt spliced in a straight line.

3.2 CONSTRUCTION QUALITY CONTROL

Attention is directed to SECTION: CONSTRUCTION QUALITY CONTROL which requires the Contractor to perform quality control inspection, testing, and reporting.

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SECTION 03250

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SECTION 03250

EXPANSION JOINTS AND CONTRACTION JOINTS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN HARDBOARD ASSOCIATION (AHA)

AHA A135.4 (1982; R 1988) Basic Hardboard

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 1751 (1983; R 1991) Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)

ASTM D 1752 (1984; R 1992) Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction

ASTM D 5249 (1992) Backer Material for Use With Cold and Hot-Applied Joint Sealants in Portland-Cement Concrete and Asphalt Joints

FEDERAL SPECIFICATIONS (FS)

FS SS-S-1401 (Rev C; Am 2; Notice 1) Sealant, Joint, Non-Jet-Fuel-Resistant, Hot-Applied, for Portland Cement and Asphalt Concrete Pavements

FS SS-S-200 (Rev E; Am 2) Sealants, Joint, Two-Component, Jet-Blast-Resistant, Cold-Applied, for Portland Cement Concrete Pavement

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL PROCEDURES:

SD-01 Data

Materials; FIO.

Manufacturer's catalog data and manufacturer's recommended instructions for

joint fillers and sealants.

SD-13 Certificates

Materials; GA.

Certificates of compliance stating that the joint filler and sealant materials and waterstops conform to the requirements specified.

1.3 DELIVERY AND STORAGE

Material delivered and placed in storage shall be stored off the ground and protected from moisture, dirt, and other contaminants. Sealants shall be delivered in the manufacturer's original unopened containers. Sealants whose shelf life has expired shall be removed from the site.

PART 2 PRODUCTS

2.1 CONTRACTION JOINT STRIPS

Contraction joint strips shall be 3 mm (1/8 inch) thick tempered hardboard conforming to AHA A135.4, Class 1. In lieu of hardboard strips, rigid polyvinylchloride (PVC) or high impact polystyrene (HIPS) insert strips specifically designed to induce controlled cracking in slabs on grade may be used. Such insert strips shall have removable top section.

2.2 PREFORMED EXPANSION JOINT FILLER

Expansion joint filler shall be preformed material conforming to ASTM D 1751 or ASTM D 1752. Unless otherwise indicated, filler material shall be 10 mm (3/8 inch) thick and of a width applicable for the joint formed. Backer material, when required, shall conform to ASTM D 5249.

2.3 SEALANT

Joint sealant shall conform to the following:

2.3.1 Hot-Poured Type

FS SS-S-1401,
FS SS-S-200

PART 3 EXECUTION

3.1 JOINTS

Joints shall be installed at locations indicated and as authorized.

3.1.1 Sawed Joints

Joint sawing shall be early enough to prevent uncontrolled cracking in the slab, but late enough that this can be accomplished without appreciable spalling. Concrete sawing machines shall be adequate in number and power, and with sufficient replacement blades to complete the sawing at the required rate. Joints shall be cut to true alignment and shall be cut in sequence of concrete placement. Sludge and cutting debris shall be removed.

3.1.2 Expansion Joints

Preformed expansion joint filler shall be used in expansion and isolation joints in slabs around columns and between slabs on grade and vertical surfaces where indicated. The filler shall extend the full slab depth, unless otherwise indicated. The edges of the joint shall be neatly finished with an edging tool of 3 mm (1/8 inch) radius, except where a resilient floor surface will be applied. Where the joint is to receive a sealant, the filler strips shall be installed at the proper level below the finished floor with a slightly tapered, dressed and oiled wood strip temporarily secured to the top thereof to form a recess to the size shown on the drawings. The wood strip shall be removed after the concrete has set. Contractor may opt to use a removable expansion filler cap designed and fabricated for this purpose in lieu of the wood strip. The groove shall be thoroughly cleaned of laitance, curing compound, foreign materials, protrusions of hardened concrete, and any dust which shall be blown out of the groove with oil-free compressed air.

3.1.3 Joint Sealant

Sawed contraction joints and expansion joints in slabs shall be filled with joint sealant, unless otherwise shown. Joint surfaces shall be clean, dry, and free of oil or other foreign material which would adversely affect the bond between sealant and concrete. Joint sealant shall be applied as recommended by the manufacturer of the sealant. Joints sealed with field molded sealant shall be completely filled with sealant.

3.2 CONSTRUCTION QUALITY CONTROL

Attention is directed to SECTION: CONSTRUCTION QUALITY CONTROL which requires the Contractor to perform quality control inspection, testing, and reporting.

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SECTION 03300

CONCRETE FOR BUILDING CONSTRUCTION

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN CONCRETE INSTITUTE (ACI)

ACI 117/117R	(1990; Errata) Standard Tolerances for Concrete Construction and Materials
ACI 211.1	(1991) Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete
ACI 301	(1989) Structural Concrete for Buildings
ACI 305R	(1991) Hot Weather Concreting
ACI 318/318R	(1989; Rev 1992; Errata) Building Code Requirements for Reinforced Concrete

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 31	(1991) Making and Curing Concrete Test Specimens in the Field
ASTM C 33	(1993) Concrete Aggregates
ASTM C 39	(1986) Compressive Strength of Cylindrical Concrete Specimens
ASTM C 42	(1990) Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
ASTM C 94	(1994) Ready-Mixed Concrete
ASTM C 109	(1993) Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or 50-mm Cube Specimens)
ASTM C 143	(1990a) Slump of Hydraulic Cement Concrete
ASTM C 150	(1994) Portland Cement
ASTM C 171	(1992) Sheet Materials for Curing Concrete
ASTM C 172	(1990) Sampling Freshly Mixed Concrete
ASTM C 173	(1994a) Air Content of Freshly Mixed Concrete by the Volumetric Method

ASTM C 192	(1990a) Making and Curing Concrete Test Specimens in the Laboratory
ASTM C 231	(1991b) Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C 260	(1994) Air-Entraining Admixtures for Concrete
ASTM C 309	(1993) Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C 494	(1992) Chemical Admixtures for Concrete
ASTM C 595	(1994a) Blended Hydraulic Cements
ASTM C 597	(1983; R 1991) Pulse Velocity Through Concrete
ASTM C 618	(1994) Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete
ASTM C 803	(1990) Penetration Resistance of Hardened Concrete
ASTM C 805	(1985) Rebound Number of Hardened Concrete
ASTM C 1017	(1992) Chemical Admixtures for Use in Producing Flowing Concrete
ASTM E 96	(1994) Water Vapor Transmission of Materials

FEDERAL SPECIFICATIONS (FS)

FS CCC-C-467	(Rev C) Cloth, Burlap, Jute (or Kenaf)
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NATIONAL READY-MIXED CONCRETE ASSOCIATION (NRMCA)

NRMCA-01	(1992) Truck Mixer Agitator and Front Discharge Concrete Carrier Standards of the Truck Mixer Manufacturers Bureau
NRMCA CPMB 100	(1990) Concrete Plant Standards
NRMCA QC 3	(1984) Quality Control Manual: Section 3, Plant Certifications Checklist: Certification of Ready-Mixed Concrete Production Facilities

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL PROCEDURES:

SD-08 Statements

Proportions of Mix; GA

The results of trial mix along with a statement giving the maximum nominal coarse aggregate size and the proportions of all ingredients that will be used in the manufacture of each strength of concrete, at least 30 days prior to commencing concrete placing operations. Aggregate weights shall be based on the saturated surface dry condition. The statement shall be accompanied by test results from an independent commercial testing laboratory, attesting that the proportions selected will produce concrete of the qualities indicated. No substitutions shall be made in the materials used in the work without additional tests to show that the quality of the concrete is satisfactory.

SD-09 Reports

Sampling and Testing; GA

Certified copies of laboratory test reports, including all test data, for aggregate, admixtures, and curing compound. These tests shall be made by an approved commercial laboratory or by a laboratory maintained by the manufacturers of the materials.

SD-13 Certificates

Cementitious Materials; GA

Manufacturer's certification of compliance, accompanied by mill test reports attesting that the materials meet the requirements of the specification under which it is furnished, for cement and pozzolan. No cement and pozzolan shall be used until notice of acceptance has been given. Cement and pozzolan may be subjected to check testing by the Government from samples obtained at the mill, at transfer points, or at the project site.

1.3 GENERAL REQUIREMENTS

Tolerances for concrete construction and materials shall be in accordance with ACI 117/117R.

1.3.1 Strength Requirements

Structural concrete for all interior and exterior works shall have minimum 28-day compressive strength of 28 MPa.

1.3.2 Air Entrainment

For exterior concrete, air content by volume of concrete shall be maintained at 5 to 7 percent as determined in conformance with ASTM C 231. Interior concrete shall have 3 to 5 percent air content.

1.3.3 Special Properties

Concrete may contain other admixtures, such as water reducers, superplasticizers, or set retarding agents to provide special properties to the concrete, if approved.

1.3.4 Slump

Slump shall be within the following limits:

<u>Structural Element</u>	<u>Slump in millimeters</u>	
	<u>Minimum</u>	<u>Maximum</u>
Walls, columns and beams	50	100
Foundation walls, substructure walls, footings, pavement, and slabs	25	75
Any structural concrete approved for placement by pumping	None	150

*Where use of superplasticizers are approved to produce flowing concrete these slump requirements do not apply.

1.3.5 Technical Service for Specialized Concrete

The service of a technical representative shall be obtained to oversee proportioning, batching, mixing, placing, consolidating and finishing of specialized structural concrete, such as lightweight or flowing concrete until field controls indicate concrete of specified quality is furnished.

1.4 PROPORTIONS OF MIX

1.4.1 Mixture Proportioning, Normal Weight Concrete

Trial batches shall contain materials proposed to be used in the project. Trial mixtures having proportions, consistencies and air content suitable for the work shall be made based on methodology described in ACI 211.1, using at least three different water-cement ratios. Trial mixes shall be proportioned to produce concrete strengths specified. Trial mixtures shall be designed for maximum permitted slump and air content. The temperature of concrete in each trial batch shall be reported. For each water-cement ratio at least three test cylinders or beams for each test age shall be made and cured in accordance with ASTM C 192. They shall be tested at 7 and 28 days in accordance with ASTM C 39. From these test results a curve shall be plotted showing the relationship between water-cement ratio and strength. For each strength of concrete the maximum allowable water-cement ratio shall be that shown by these curves to produce an average strength as specified in paragraph AVERAGE STRENGTH. Pozzolan shall be utilized and be proportioned by 20 to 25 percent by volume of cement replacement.

1.4.2 Average Strength

In meeting the strength requirements specified, the selected mixture proportion shall produce an average compressive strength exceeding the specified strength by the amount indicated below. Where a concrete production facility has test records, a standard deviation shall be established. Test records from which a standard deviation is calculated shall represent materials, quality control procedures, and conditions similar to those expected; shall represent concrete produced to meet a specified strength or strengths within 7 MPa of that specified for proposed work; and shall consist of at least 30 consecutive tests. A strength test shall be the average of the strengths of two cylinders made

from the same sample of concrete and tested at 28 days or at other test age designated for determination of the specified strength.

1.4.2.1 Test Records Exceeding 29

Required average compressive strength used as the basis for selection of concrete proportions shall be the larger of the specified strength plus the standard deviation multiplied by 1.34 or the specified strength plus the standard deviation multiplied by 2.33 minus 500.

1.4.2.2 Test Records Less Than 29

Where a concrete production facility does not have test records meeting the above requirements but does have a record based on 15 to 29 consecutive tests, a standard deviation may be established as the product of the calculated standard deviation and a modification factor from the following table:

No. of tests (1)	Modification factor for standard deviation
less than 15	See Note
15	1.16
20	1.08
25	1.03
30 or more	1.00

(1) Interpolate for intermediate numbers of tests.

When a concrete production facility does not have field strength test records for calculation of standard deviation or the number of tests is less than 15, the required average strength shall be:

- a. The specified strength plus 7 specified strength of less than 21 MPa.
- b. The specified strength plus 8 for specified strengths of 21 to 35 MPa.

1.5 STORAGE OF MATERIALS

Cement and pozzolan shall be stored in weathertight buildings, bins, or silos which will exclude moisture and contaminants. Aggregate stockpiles shall be arranged and used in a manner to avoid excessive segregation and to prevent contamination with other materials or with other sizes of aggregates. Reinforcing bars and accessories shall be stored above the ground on platforms, skids or other supports. Other materials shall be stored in such a manner as to avoid contamination and deterioration. Admixtures which have been in storage at the project site for longer than 6 months or which have been subjected to freezing shall not be used unless retested and proven to meet the specified requirements.

PART 2 PRODUCTS

2.1 ADMIXTURES

Admixtures shall conform to the following:

2.1.1 Accelerating Admixture

ASTM C 494, Type C or E.

2.1.2 Air-Entraining Admixture

ASTM C 260.

2.1.3 Flowing Concrete Admixture

ASTM C 1017, Type 1 or 2.

2.1.4 Water-Reducing or Retarding Admixture

ASTM C 494, Type A, B, D, F, or G. Type G admixture shall not be used for slabs-on-grade.

2.2 CEMENTITIOUS MATERIALS

Cementitious materials shall each be of one type and from one source when used in concrete which will have surfaces exposed in the finished structure. Cementitious materials shall conform to one of the following:

2.2.1 Cement

ASTM C 150, Type II, low alkali.

2.2.2 Portland-Pozzolan Cement

ASTM C 595, Type IP, low alkali.

2.2.3 Pozzolan

ASTM C 618, Class F. Loss on ignition shall not exceed 3.0 percent. Supplementary optional chemical requirements shall apply.

2.3 AGGREGATES

Aggregates shall conform to the following:

2.3.1 Normal Weight Aggregate

ASTM C 33. Grading requirement for coarse aggregate shall conform to size number 57. The maximum size aggregate shall be 25.4 mm (1 inches).

2.4 CURING MATERIALS

2.4.1 Burlap

FS CCC-C-467.

2.4.2 Impervious Sheets

ASTM C 171, type optional, except that polyethylene film, if used, shall be white opaque.

2.4.3 Membrane-Forming Compounds

ASTM C 309, Type 1-D, Class A or B.

2.5 VAPOR BARRIER

Vapor barrier shall be polyethylene sheeting with a minimum thickness of 0.506 mm (20 mils) or other equivalent material having a vapor permeance rating not exceeding 28.6 nanograms per Pascal per second per square meter (0.5 perms) as determined in accordance with ASTM E 96. Sheeting shall be covered by a 100 mm thick layer of sand, which conforms to ASTM C 33. Sand shall be moistened and compacted by two passes of a 550 kg (minimum) vibratory plate compactor.

2.6 WATER

Water shall be potable, except that nonpotable water may be used if it produces mortar cubes having 7- and 28-day strengths at least 90 percent of the strength of similar specimens made with water from a municipal supply. The strength comparison shall be made on mortars, identical except for mixing water, prepared and tested in accordance with ASTM C 109. Water for curing shall not contain any substance injurious to concrete, or which causes staining.

PART 3 EXECUTION

3.1 PREPARATION OF SURFACES

Surfaces to receive concrete shall be clean and free from frost, ice, mud, and water. Conduit and other similar items shall be in place and clean of any deleterious substance.

3.1.1 Foundations

Earthwork shall be as specified in Section 02221 EXCAVATION, FILLING, AND BACKFILLING FOR BUILDINGS. Flowing water shall be diverted without washing over freshly deposited concrete. Rock foundations shall be cleaned by high velocity air-water jets, sandblasting, or other approved methods. Debris and loose, semi-detached or unsound fragments shall be removed. Rock surfaces shall be moist but without free water when concrete is placed. Semiporous subgrades for foundations and footings shall be damp when concrete is placed. Pervious subgrades shall be sealed by blending impervious material with the top 150 mm of the in-place pervious material or by covering with an impervious membrane.

3.1.2 Vapor Barrier

Unless otherwise indicated, subgrades for slabs in buildings shall be covered with a vapor barrier. Vapor barrier edges shall be lapped at least 100 mm and ends shall be lapped not less than 150 mm. Patches and lapped joints shall be sealed with pressure-sensitive adhesive or tape not less than 50 mm wide and compatible with the membrane.

3.2 BATCHING, MIXING AND TRANSPORTING CONCRETE

Ready-mixed concrete shall be batched, mixed and transported in accordance with ASTM C 94, except as otherwise specified. Truck mixers, agitators, and nonagitating units shall comply with NRMCA-01. Ready-mix plant

equipment and facilities shall be certified in accordance with NRMCA QC 3. Site-mixed concrete shall be mixed in accordance with ACI 301. On site plant shall conform to the NRMCA CPMB 100.

3.2.1 Admixtures

Admixtures shall be batched within an accuracy of 3 percent. Where two or more admixtures are used in the same batch, they shall be batched separately and must be compatible. Retarding admixture shall be added within one minute after addition of water is complete or in the first quarter of the required mixing time, whichever is first. Concrete that shows evidence of total collapse or segregation caused by the use of admixture shall be removed from the site.

3.2.2 Control of Mixing Water

No water from the truck system or elsewhere shall be added after the initial introduction of mixing water for the batch except when on arrival at the jobsite, the slump of the concrete is less than that specified. Water added to bring the slump within the specified range shall not change the total water in the concrete to a point that the approved water-cement ratio is exceeded. The drum shall be turned an additional 30 revolutions, or more, if necessary, until the added water is uniformly mixed into the concrete. Water shall not be added to the batch at any later time.

3.3 SAMPLING AND TESTING

Sampling and Testing is the responsibility of the Contractor and shall be performed by an approved testing agency. All sampling, testing, recording and submittal of test results shall be in accordance with the Construction Control Manual.

3.3.1 Aggregates

Aggregates for normal weight concrete shall be sampled and tested in accordance with ASTM C 33. Gradation tests shall be performed on the first day and every other day thereafter during concrete construction.

3.3.2 Sampling of Concrete

Samples of concrete for air, slump, unit weight, and strength tests shall be taken in accordance with ASTM C 172

3.3.2.1 Air Content

Test for air content shall be performed in accordance with ASTM C 173 or ASTM C 231.

3.3.2.2 Slump

At least 2 slump tests shall be made on randomly selected batches of each mixture of concrete during each day's concrete placement. Tests shall be performed in accordance with ASTM C 143.

3.3.3 Evaluation and Acceptance of Concrete

3.3.3.1 Frequency of Testing

Samples for strength tests of each class of concrete placed each day shall

be taken not less than once a day. Number and frequency of test specimens shall be in accordance with the Construction Control Manual. Field cured specimens for determining form removal time or when a structure may be put in service shall be made in numbers directed to check the adequacy of curing and protection of concrete in the structure. The specimens shall be removed from the molds at the age of 24 hours and shall be cured and protected, insofar as practicable, in the same manner as that given to the portion of the structure the samples represent.

3.3.3.2 Testing Procedures

Cylinders for acceptance tests shall be molded and cured in accordance with ASTM C 31. Cylinders shall be tested in accordance with ASTM C 39. A strength test shall be the average of the strengths of two cylinders or beams made from the same sample of concrete and tested at 28 days or at another specified test age.

3.3.3.3 Evaluation of Results

Concrete specified on the basis of compressive strength will be considered satisfactory if the averages of all sets of three consecutive strength test results equal or exceed the specified strength and no individual strength test result falls below the required strength by more than 3.4 MPa. If any of these requirements are not met, the Contracting Officer will require changes in the proportions of the concrete mix.

3.3.4 Investigation of Low-Strength Test Results

When any strength test of standard-cured test cylinder falls below the specified strength requirement by more than 3.4 MPa, or if tests of field-cured cylinders indicate deficiencies in protection and curing, steps shall be taken to assure that load-carrying capacity of the structure is not jeopardized. Nondestructive testing in accordance with ASTM C 597, ASTM C 803 or ASTM C 805 may be permitted by the Contracting Officer to determine the relative strengths at various locations in the structure as an aid in evaluating concrete strength in place or for selecting areas to be cored. Such tests, unless properly calibrated and correlated with other test data, shall not be used as a basis for acceptance or rejection. When strength of concrete in place is considered potentially deficient, cores shall be obtained and tested in accordance with ASTM C 42. At least three representative cores shall be taken from each member or area of concrete in place that is considered potentially deficient. The location of cores shall be determined by the Contracting Officer to least impair the strength of the structure. If the concrete in the structure will be dry under service conditions, the cores shall be air dried (temperature 16 to 27 degrees C, relative humidity less than 60 percent) for seven days before testing and shall be tested dry. If the concrete in the structure will be more than superficially wet under service conditions, the cores shall be tested after moisture conditioning in accordance with ASTM C 42. Concrete in the area represented by the core testing will be considered adequate if the average strength of the cores is equal to or at least 85 percent of the specified strength requirement and if no single core is less than 75 percent of the specified strength requirement. If the core tests are inconclusive or impractical to obtain, or if structural analysis does not confirm the safety of the structure, load tests may be directed by the Contracting Officer in accordance with the requirements of ACI 318/318R. Concrete work evaluated by structural analysis or by results of a load test and found deficient shall be corrected in a manner satisfactory to the Contracting Officer. All investigations, testing, load tests, and

correction of deficiencies shall be performed, and approved by the Contracting Officer, at the expense of the Contractor.

3.4 CONVEYING CONCRETE

Concrete shall be conveyed from mixer to forms as rapidly as possible and within the time interval specified in paragraph CONCRETE PLACEMENT by methods which will prevent segregation or loss of ingredients. Each load of concrete shall be visually inspected for slump conformance prior to entering the conveyance apparatus or forms. Inspections shall be made by a person who has been certified by the American Concrete Institute to perform such inspection. Concrete which appears to exceed the specified tolerance shall be slumped in accordance with ASTM C 143. Concrete which is determined to exceed the maximum allowable slump shall be returned to the batch plant and wasted at no additional cost to the Government. All slumps, both visual and physical, shall be recorded as required by the Construction Control Manual.

3.4.1 Chutes

When concrete can be placed directly from a truck mixer or other transporting equipment, chutes attached to this equipment may be used. Separate chutes will not be permitted except when specifically approved.

3.4.2 Buckets

Bucket design shall be such that concrete of the required slump can be readily discharged. Bucket gates shall be essentially grout tight when closed. The bucket shall provide means for positive regulations of the amount and rate of deposit of concrete in each dumping position.

3.4.3 Belt Conveyors

Belt conveyors may be used when approved. Belt conveyors shall be designed for conveying concrete and shall be operated to assure a uniform flow of concrete to the final place of deposit without segregation or loss of mortar. Conveyors shall be provided with positive means for preventing segregation of the concrete at transfer points and point of placement.

3.4.4 Pumps

Concrete may be conveyed by positive displacement pumps when approved. Pump shall be the piston or squeeze pressure type. Pipeline shall be steel pipe or heavy duty flexible hose. Inside diameter of the pipe shall be at least three times the maximum size of the coarse aggregate. Distance to be pumped shall not exceed the limits recommended by the pump manufacturer. Concrete shall be supplied to the pump continuously. When pumping is completed, the concrete remaining in the pipeline shall be ejected without contaminating the concrete in place. After each use, the equipment shall be thoroughly cleaned. Flushing water shall be wasted outside the forms.

3.5 CONCRETE PLACEMENT

Mixed concrete which is transported in truck mixers or agitators or concrete which is truck mixed, shall be discharged within 1-1/2 hours or before the drum has revolved 300 revolutions, whichever comes first after the introduction of the mixing water to the cement and aggregates or the introduction of the cement to the aggregates. These limitations may be waived by the Government if the concrete is of such slump after the 1-1/2

hour time or 300 revolution limit has been reached that it can be placed, without the addition of water to the batch. When the concrete temperature exceeds 29 degrees C, the time shall be reduced to 45 minutes. Concrete shall be placed within 15 minutes after it has been discharged from the truck.

3.5.1 Placing Operation

Concrete shall be handled from mixer to forms in a continuous manner until the approved unit of operation is completed. Adequate scaffolding, ramps and walkways shall be provided so that personnel and equipment are not supported by in-place reinforcement. Placing will not be permitted when the sun, heat, wind, or limitations of facilities furnished by the Contractor prevent proper consolidation, finishing and curing. Concrete shall be deposited as close as possible to its final position in the forms, and there shall be no vertical drop greater than 2.5 m except where suitable equipment is provided to prevent segregation and where specifically authorized. Depositing of the concrete shall be so regulated that it will be effectively consolidated in horizontal layers not more than 300 mm thick, except that all slabs shall be placed in a single layer. Concrete to receive other construction shall be screeded to the proper level to avoid excessive shimming or grouting.

3.5.2 Consolidation

Immediately after placing, each layer of concrete shall be consolidated by internal vibrators, except for slabs 100 mm or less. The vibrators shall at all times be adequate in effectiveness and number to properly consolidate the concrete; a spare vibrator shall be kept at the jobsite during all concrete placing operations. The vibrators shall have a frequency of not less than 8000 vibrations per minute, and the head diameter and amplitude shall be appropriate for the concrete mixture being placed. Vibrators shall be inserted vertically at uniform spacing over the area of placement. The distance between insertions shall be approximately 1-1/2 times the radius of action of the vibrator so that the area being vibrated will overlap the adjacent just-vibrated area by a few inches. The vibrator shall penetrate rapidly to the bottom of the layer and at least 150 mm into the preceding layer if there is such. Vibrator shall be held stationary until the concrete is consolidated and then withdrawn slowly. The use of form vibrators must be specifically approved. Vibrators shall not be used to transport concrete within the forms. Slabs 100 mm and less in thickness shall be consolidated by properly designed vibrating screeds or other approved technique.

3.5.3 Cold Weather Requirements

Special protection measures, approved by the Contracting Officer, shall be used if freezing temperatures are anticipated before the expiration of the specified curing period. The ambient temperature of the air where concrete is to be placed and the temperature of surfaces to receive concrete shall be not less than 4 degrees C. The temperature of the concrete when placed shall be not less than 10 degrees C nor more than 24 degrees C. Heating of the mixing water or aggregates will be required to regulate the concrete placing temperature. Materials entering the mixer shall be free from ice, snow, or frozen lumps. Salt, chemicals or other materials shall not be incorporated in the concrete to prevent freezing. Upon written approval, calcium chloride or chemical admixture conforming to ASTM C 494 Type C or E may be used. Any concrete damaged by inadequate protection or procedure shall be removed and replaced at no additional cost to the government.

3.5.4 Warm Weather Requirements

The temperature of the concrete placed during warm weather shall not exceed 30 degrees C except where an approved retarder is used. The mixing water and/or aggregates shall be cooled, if necessary, to maintain a satisfactory placing temperature. In no case shall the placing temperature exceed 35 degrees C.

3.6 CONSTRUCTION JOINTS

Construction joints shall be located as indicated or approved. Where concrete work is interrupted by weather, end of work shift or other similar type of delay, location and type of construction joint shall be subject to approval of the Contracting Officer. Unless otherwise indicated and except for slabs on grade, reinforcing steel shall extend through construction joints. Construction joints in slabs on grade shall be keyed or doweled as shown. Concrete columns, walls, or piers shall be in place at least 2 hours, or until the concrete is no longer plastic, before placing concrete for beams, girders, or slabs thereon. In walls having door window openings, lifts shall terminate at the top and bottom of the opening. Other lifts shall terminate at such levels as to conform to structural requirements or architectural details. Where horizontal construction joints are required, a strip of 25.4 mm (1 inch) square-edge lumber, bevelled and oiled to facilitate removal, shall be tacked to the inside of the forms at the construction joint. Concrete shall be placed to a point 25 mm above the underside of the strip. The strip shall be removed 1 hour after the concrete has been placed, and any irregularities in the joint line shall be leveled off with a wood float, and all laitance shall be removed. Prior to placing additional concrete, horizontal construction joints shall be prepared as specified in paragraph PREPARATIONS OF SURFACES.

3.7 FINISHING CONCRETE

3.7.1 Formed Surfaces

3.7.1.1 Repair of Surface Defects

Surface defects shall be repaired within 24 hours after the removal of forms. Honeycombed and other defective areas shall be cut back to solid concrete or to a depth of not less than 25 mm, whichever is greater. Edges shall be cut perpendicular to the surface of the concrete. The prepared areas shall be dampened and brush-coated with neat cement grout. The repair shall be made using mortar consisting of not more than 1 part cement to 2-1/2 parts sand. The mixed mortar shall be allowed to stand to stiffen (approximately 45 minutes), during which time the mortar shall be intermittently remixed without the addition of water. After the mortar has attained the stiffest consistency that will permit placing, the patching mix shall be thoroughly tamped into place by means approved by the Contracting Officer and finished slightly higher than the surrounding surface. For Class B finished surfaces the cement used in the patching mortar shall be a blend of job cement and white cement proportioned to produce a finished repair surface matching, after curing, the color of adjacent surfaces. Holes left after the removal of form ties shall be cleaned and filled with patching mortar. Holes left by the removal of tie rods shall be reamed and filled by dry-packing. Repaired surfaces shall be cured as required for adjacent surfaces. The temperature of concrete, mortar patching material, and ambient air shall be above 10 degrees C while making repairs and during the curing period. Concrete with defects

which affect the strength of the member or with excessive honeycombs will be rejected, or the defects shall be corrected as directed.

3.7.1.2 Class B Finish

Where a Class B finish is indicated, fins shall be removed. Concrete surface shall be smooth with a texture at least equal to that obtained through the use of Grade B-B plywood forms.

3.7.1.3 Class C Finish

Where a Class C finish is indicated, fins shall be removed. Concrete surfaces shall be relatively smooth with a texture imparted by the forms used.

3.7.1.4 Class D Finish

Where a Class D finish is indicated, fins exceeding 6 mm in height shall be chipped or rubbed off. Concrete surfaces shall be left with the texture imparted by the forms used.

3.7.2 Unformed Surfaces

In cold weather, the air temperature in areas where concrete is being finished shall not be less than 10 degrees C. In hot windy weather when the rate of evaporation of surface moisture, as determined by methodology presented in ACI 305R, may reasonably be expected to exceed 1 kg per square meter per hour (0.2 per square foot per hour); coverings, windbreaks, or fog sprays shall be provided as necessary to prevent premature setting and drying of the surface. The dusting of surfaces with dry materials or the addition of water during finishing will not be permitted. Finished surfaces shall be plane, with no deviation greater than 8 mm (5/16 inch) when tested with a 3.05 m (10 foot) straightedge. Floor tolerance measurements shall be made as soon as possible after finishing. When forms or shoring are used the measurements shall be made prior to their removal. Surfaces shall be pitched to drains.

3.7.2.1 Rough-Slab Finish

Slabs to receive fill or mortar setting beds shall be screeded with straightedges immediately after consolidation to bring the surface to the required finish level with no coarse aggregate visible.

3.7.2.2 Float Finish

Slabs to receive a steel trowel finish shall be given a float finish. Screeding shall be followed immediately by darbying or bull floating before bleeding water is present, to bring the surface to a true, even plane. After the concrete has stiffened to permit the operation and the water sheen has disappeared, it shall be wood floated. Concrete that portrays stickiness shall be finished with a magnesium float in lieu of a wood float, and left free of ridges and other projections. Float finish is normally specified for surfaces that will receive other treatment such as built-up roofing, nonslip surfacing material or other types of dry-shake surface. It should not be specified as a wearing surface.

3.7.2.3 Trowel Finish

Slabs shall be given a trowel finish immediately following floating.

Surfaces shall be trowelled to produce smooth, dense slabs free from blemishes including trowel marks. In lieu of hand finishing, an approved power finishing machine may be used in accordance with the directions of the machine manufacturer. A final hard steel troweling shall be done by hand. Trowel finish will be specified for most wearing surfaces and where a smooth finish is required.

3.7.2.4 Broom Finish

After floating, slabs, where indicated, shall be lightly trowelled, and then broomed with a fiber-bristle brush in a direction transverse to that of the main traffic.

3.8 CURING AND PROTECTION

3.8.1 General

All concrete shall be cured by an approved method for the period of time given below:

Concrete with Type II cement blended with pozzolan	7 days
----------------------------------------------------	--------

Immediately after placement, concrete shall be protected from premature drying extremes in temperatures, rapid temperature change, mechanical injury and injury from rain and flowing water. Air and forms in contact with concrete shall be maintained at a temperature above 10 degrees C for the first 3 days and at a temperature above 0 degrees C for the remainder of the specified curing period. Exhaust fumes from combustion heating units shall be vented to the outside of the enclosure and heaters and ducts shall be placed and directed so as not to cause areas of overheating and drying of concrete surfaces or to create fire hazards. All materials and equipment needed for adequate curing and protection shall be available and at the site prior to placing concrete. No fire or excessive heat shall be permitted near or in direct contact with the concrete at any time. Curing shall be accomplished by any of the following methods, or combination thereof, as approved, except that all slabs shall be moist cured for the first 24 hours.

3.8.2 Moist Curing

Concrete to be moist-cured shall be maintained continuously wet for the entire curing period. If water or curing materials used stains or discolors concrete surfaces which are to be permanently exposed, the concrete surfaces shall be cleaned. When wooden forms are left in place during curing, they shall be kept wet at all times. If the forms are removed before the end of the curing period, curing shall be carried out as on unformed surfaces, using suitable materials. Horizontal surfaces shall be cured by ponding, by covering with a 50 mm minimum thickness of continuously saturated sand, or by covering with waterproof paper, polyethylene sheet, polyethylene-coated burlap or saturated burlap.

3.8.3 Membrane Curing

Membrane curing shall not be used on surfaces that are to receive any subsequent treatment depending on adhesion or bonding to the concrete; except a styrene acrylate or chlorinated rubber compound meeting ASTM C 309, Class B requirements may be used for surfaces which are to be painted or are to receive bituminous roofing or waterproofing, or floors that are to receive adhesive applications of resilient flooring. The curing compound selected shall be compatible with any subsequent paint, roofing,

waterproofing or flooring specified. Membrane curing compound shall not be used on surfaces that are maintained at curing temperatures with free steam. Curing compound shall be applied to formed surfaces immediately after the forms are removed and prior to any patching or other surface treatment except the cleaning of loose sand, mortar, and debris from the surface. Surfaces shall be thoroughly moistened with water and the curing compound shall be applied to slab surfaces as soon as the bleeding water has disappeared, with the tops of joints being temporarily sealed to prevent entry of the compound and to prevent moisture loss during the curing period. Compound shall be applied in a one-coat continuous operation by mechanical spraying equipment, at a uniform coverage in accordance with the manufacturer's printed instructions. Concrete surfaces which have been subjected to rainfall within 3 hours after curing compound has been applied shall be resprayed by the method and at the coverage specified. On surfaces permanently exposed to view, the surface shall be shaded from direct rays of the sun for the duration of the curing period. Surfaces coated with curing compound shall be kept free of foot and vehicular traffic, and from other sources of abrasion and contamination during the curing period.

3.9 SETTING BASE PLATES AND BEARING PLATES

After being properly positioned, column base plates, bearing plates for beams and similar structural members, and machinery and equipment base plates shall be set to the proper line and elevation with damp-pack bedding mortar, except where nonshrink grout is indicated. The thickness of the mortar or grout shall be approximately 1/24 the width of the plate, but not less than 20 mm. Concrete and metal surfaces in contact with grout shall be clean and free of oil and grease, and concrete surfaces in contact with grout shall be damp and free of laitance when grout is placed.

3.9.1 Damp-Pack Bedding Mortar

Damp-pack bedding mortar shall consist of 1 part cement and 2-1/2 parts fine aggregate having water content such that a mass of mortar tightly squeezed in the hand will retain its shape but will crumble when disturbed. The space between the top of the concrete and bottom of the bearing plate or base shall be packed with the bedding mortar by tamping or ramming with a bar or rod until it is completely filled.

3.9.2 Nonshrink Grout

Nonshrink grout shall be mixed and placed in accordance with material manufacturer's written recommendations. Forms of wood or other suitable material shall be used to retain the grout. The grout shall be placed quickly and continuously, completely filling the space without segregation or bleeding of the mix.

3.10 CONSTRUCTION QUALITY CONTROL

Attention is directed to SECTION: CONSTRUCTION QUALITY CONTROL which requires the Contractor to perform quality control inspection, testing, and reporting.

-- End of Section --

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SECTION 05055

WELDING, STRUCTURAL

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC-04 (1989) Specification for Structural Steel Buildings - Allowable Stress Design and Plastic Design

AMERICAN SOCIETY FOR NONDESTRUCTIVE TESTING (ASNT)

ASNT-01 (1992; Supple) Recommended Practice SNT-TC-1A

AMERICAN WELDING SOCIETY (AWS)

AWS A2.4 (1993) Standard Symbols for Welding, Brazing and Nondestructive Examination

AWS A3.0 (1994) Standard Welding Terms and Definitions

AWS D1.1 (1994) Structural Welding Code - Steel

AWS Z49.1 (1988) Safety in Welding and Cutting

1.2 DEFINITIONS

Definitions of welding terms shall be in accordance with AWS A3.0.

1.3 GENERAL REQUIREMENTS

The design of welded connections shall conform to AISC-04 unless otherwise indicated or specified. Material with welds will not be accepted unless the welding is specified or indicated on the drawings or otherwise approved. Welding shall be as specified in this section, except where additional requirements are shown on the drawings or are specified in other sections. Welding shall not be started until welding procedures, welders, welding operators, and tackers have been qualified and the submittals approved by the Contracting Officer. Qualification testing shall be performed at or near the work site. Each Contractor performing welding shall maintain records of the test results obtained in welding procedure, welder, welding operator, and tacker performance qualifications.

1.4 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300SUBMITTAL PROCEDURES:

SD-08 Statements

Welding Procedure Qualifications; GA.

Welder, Welding Operator, and Tacker Qualification; GA.

Inspector Qualification; GA.

Copies of the welding procedure specifications; the procedure qualification test records; and the welder, welding operator, or tacker qualification test records.

SD-18 Records

Quality Control; GA.

A quality assurance plan and records of tests and inspections.

1.5 WELDING PROCEDURE QUALIFICATIONS

Except for prequalified (per AWS D1.1) and previously qualified procedures, each Contractor performing welding shall record in detail and shall qualify the welding procedure specification for any welding procedure followed in the fabrication of weldments. Qualification of welding procedures shall conform to AWS D1.1 and to the specifications in this section. Copies of the welding procedure specification and the results of the procedure qualification test for each type of welding which requires procedure qualification shall be submitted for approval. Approval of any procedure, however, will not relieve the Contractor of the sole responsibility for producing a finished structure meeting all the requirements of these specifications. This information shall be submitted on the forms in Appendix E of AWS D1.1. Welding procedure specifications shall be individually identified and shall be referenced on the detail drawings and erection drawings, or shall be suitably keyed to the contract drawings. In case of conflict between this specification and AWS D1.1, this specification governs.

1.5.1 Previous Qualifications

Welding procedures previously qualified by test may be accepted for this contract without requalification if the following conditions are met:

- a. Testing was performed by an approved testing laboratory, technical consultant, or the Contractor's approved quality control organization.
- b. The qualified welding procedure conforms to the requirements of this specification and is applicable to welding conditions encountered under this contract.
- c. The welder, welding operator, and tacker qualification tests conform to the requirements of this specification and are applicable to welding conditions encountered under this contract.

1.5.2 Prequalified Procedures

Welding procedures which are considered prequalified as specified in AWS D1.1 will be accepted without further qualification. The Contractor shall submit for approval a listing or an annotated drawing to indicate the joints not prequalified. Procedure qualification shall be required for these joints.

1.5.3 Retests

If welding procedure fails to meet the requirements of AWS D1.1, the procedure specification shall be revised and requalified, or at the Contractor's option, welding procedure may be retested in accordance with AWS D1.1. If the welding procedure is qualified through retesting, all test results, including those of test welds that failed to meet the requirements, shall be submitted with the welding procedure.

1.6 WELDER, WELDING OPERATOR, AND TACKER QUALIFICATION

Each welder, welding operator, and tacker assigned to work on this contract shall be qualified in accordance with the applicable requirements of AWS D1.1 and as specified in this section. Welders, welding operators, and tackers who make acceptable procedure qualification test welds will be considered qualified for the welding procedure used.

1.6.1 Previous Qualifications

At the discretion of the Contracting Officer, welders, welding operators, and tackers qualified by test within the previous 6 months may be accepted for this contract without requalification if all the following conditions are met:

- a. Copies of the welding procedure specifications, the procedure qualification test records, and the welder, welding operator, and tacker qualification test records are submitted and approved in accordance with the specified requirements for detail drawings.
- b. Testing was performed by an approved testing laboratory, technical consultant, or the Contractor's approved quality control organization.
- c. The previously qualified welding procedure conforms to the requirements of this specification and is applicable to welding conditions encountered under this contract.
- d. The welder, welding operator, and tacker qualification tests conform to the requirements of this specification and are applicable to welding conditions encountered under this contract.

1.6.2 Certificates

Before assigning any welder, welding operator, or tacker to work under this contract, the Contractor shall submit the names of the welders, welding operators, and tackers to be employed, and certification that each individual is qualified as specified. The certification shall state the type of welding and positions for which the welder, welding operator, or tacker is qualified, the code and procedure under which the individual is qualified, the date qualified, and the name of the firm and person

certifying the qualification tests. The certification shall be kept on file, and 3 copies shall be furnished. The certification shall be kept current for the duration of the contract.

1.6.3 Renewal of Qualification

Requalification of a welder or welding operator shall be required under any of the following conditions:

- a. It has been more than 6 months since the welder or welding operator has used the specific welding process for which he is qualified.
- b. There is specific reason to question the welder or welding operator's ability to make welds that meet the requirements of these specifications.
- c. The welder or welding operator was qualified by an employer other than those firms performing work under this contract, and a qualification test has not been taken within the past 12 months. Records showing periods of employment, name of employer where welder, or welding operator, was last employed, and the process for which qualified shall be submitted as evidence of conformance.
- d. A tacker who passes the qualification test shall be considered eligible to perform tack welding indefinitely in the positions and with the processes for which he is qualified, unless there is some specific reason to question the tacker's ability. In such a case, the tacker shall be required to pass the prescribed tack welding test.

1.7 INSPECTOR QUALIFICATION

Inspection and nondestructive testing personnel shall be qualified in accordance with the requirements of ASNT-01 for Levels I or II in the applicable nondestructive testing method. The inspector may be supported by assistant welding inspectors who are not qualified to ASNT-01, and assistant inspectors may perform specific inspection functions under the supervision of the qualified inspector.

1.8 SYMBOLS

Symbols shall be in accordance with AWS A2.4, unless otherwise indicated.

1.9 SAFETY

Safety precautions during welding shall conform to AWS Z49.1.

PART 2 PRODUCTS

2.1 WELDING EQUIPMENT AND MATERIALS

All welding equipment, electrodes, welding wire, and fluxes shall be capable of producing satisfactory welds when used by a qualified welder or welding operator performing qualified welding procedures. All welding equipment and materials shall comply with the applicable requirements of AWS D1.1.

PART 3 EXECUTION

3.1 WELDING OPERATIONS

3.1.1 Requirements

Workmanship and techniques for welded construction shall conform to the requirements of AWS D1.1 and AISC-04. When AWS D1.1 and the AISC-04 specification conflict, the requirements of AWS D1.1 shall govern.

3.1.2 Identification

Welds shall be identified in one of the following ways:

- a. Written records shall be submitted to indicate the location of welds made by each welder, welding operator, or tacker.
- b. Each welder, welding operator, or tacker shall be assigned a number, letter, or symbol to identify welds made by that individual. The Contracting Officer may require welders, welding operators, and tackers to apply their symbol next to the weld by means of rubber stamp, felt-tipped marker with waterproof ink, or other methods that do not cause an indentation in the metal. For seam welds, the identification mark shall be adjacent to the weld at 1 meter intervals. Identification with die stamps or electric etchers shall not be allowed.

3.2 QUALITY CONTROL

Testing shall be done by an approved inspection or testing laboratory or technical consultant, or if approved, the Contractor's inspection and testing personnel may be used instead of the commercial inspection or testing laboratory or technical consultant. The Contractor shall perform visual and ultrasonic inspection to determine conformance with paragraph STANDARDS OF ACCEPTANCE. Procedures and techniques for inspection shall be in accordance with applicable requirements of AWS D1.1.

3.3 STANDARDS OF ACCEPTANCE

Dimensional tolerances for welded construction, details of welds, and quality of welds shall be in accordance with the applicable requirements of AWS D1.1 and the contract drawings. Nondestructive testing shall be by visual inspection and ultrasonic methods. The minimum extent of nondestructive testing shall be as indicated on the drawings. Percentage of welds tested shall be as follows:

Blast doors @ #1 thru #7	Full penetration welds	100%
	Other welds	50%
Trolley support beams	Full penetration welds	100%
	Other welds	50%
Canopy framing	All welds	25%
Floor and transfer rails	All welds	50%
All other welds		25%

3.3.1 Nondestructive Examination

The welding shall be subject to inspection and tests in the mill, shop, and field. Inspection and tests in the mill or shop will not relieve the Contractor of the responsibility to furnish weldments of satisfactory quality. When materials or workmanship do not conform to the specification requirements, the Government reserves the right to reject material or workmanship or both at any time before final acceptance of the structure containing the weldment.

3.3.2 Destructive Tests

When metallographic specimens are removed from any part of a structure, the Contractor shall make repairs. The Contractor shall employ qualified welders or welding operators, and shall use the proper joints and welding procedures, including peening or heat treatment if required, to develop the full strength of the members and joints cut and to relieve residual stress.

3.4 GOVERNMENT INSPECTION AND TESTING

In addition to the inspection and tests performed by the Contractor for quality control, the Government will perform inspection and testing for acceptance to the extent determined by the Contracting Officer. The costs of such inspection and testing will be borne by the Contractor if unsatisfactory welds are discovered, or by the Government if the welds are satisfactory. The work may be performed by the Government's own forces or under a separate contract for inspection and testing. The Government reserves the right to perform supplemental nondestructive and destructive tests to determine compliance with paragraph STANDARDS OF ACCEPTANCE.

3.5 CORRECTIONS AND REPAIRS

When inspection or testing indicates defects in the weld joints, the welds shall be repaired using a qualified welder or welding operator as applicable. Corrections shall be in accordance with the requirements of AWS D1.1 and the specifications. Defects shall be repaired in accordance with the approved procedures. Defects discovered between passes shall be repaired before additional weld material is deposited. Wherever a defect is removed and repair by welding is not required, the affected area shall be blended into the surrounding surface to eliminate sharp notches, crevices, or corners. After a defect is thought to have been removed, and before rewelding, the area shall be examined by suitable methods to insure that the defect has been eliminated. Repair welds shall meet the inspection requirements for the original welds. Any indication of a defect shall be regarded as a defect, unless reevaluation by nondestructive methods or by surface conditioning shows that no unacceptable defect is present.

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SECTION 05061

ULTRASONIC INSPECTION OF WELDMENTS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR NONDESTRUCTIVE TESTING (ASNT)

- | | |
|---------|-----------------------------------------------------------------------------------------------------------------------------------------|
| ASNT-01 | (1992; Supple) Recommended Practice
SNT-TC-1A |
| ASNT-04 | (1980) Question and Answer Book C:
Ultrasonic Testing Method; Levels I, II,
III (Supplement to Recommended Practice
SNT-TC-1A) |

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- | | |
|------------|--------------------------------------|
| ASTM E 165 | (1994) Liquid Penetrant Examination |
| ASTM E 709 | (1991) Magnetic Particle Examination |

AMERICAN WELDING SOCIETY (AWS)

- | | |
|----------|----------------------------------------|
| AWS D1.1 | (1994) Structural Welding Code - Steel |
|----------|----------------------------------------|

1.2 DEFINITIONS

1.2.1 A Scan

Method of data presentation on a cathode ray tube using rectangular coordinates in which a horizontal base line indicates elapsed time when reading from left to right. A vertical deflection in the base line indicates reflect signal amplitude.

1.2.2 Acoustically Similar Material

Material the same as that to be inspected; or another material proven to have acoustical velocity within plus or minus 3 percent and an attenuation within plus or minus 0.009843 dB/mm of the inspected material for the inspection frequency and wave mode, using the same mode as that to be used for inspection.

1.2.3 Amplitude

When referring to an indication in A scan presentation, amplitude is the vertical height of the indication measured from peak-to-peak for radio frequency indications and trace-to-peak for video indications.

1.2.4 Attenuation

Dissipation or loss of energy as ultrasonic vibrations travel through the material. Attenuation is caused almost entirely by scattering of the ultrasonic vibrations generated by the search unit.

1.2.5 Attenuation-Correction Controls

Circuitry to provide a continuous increase in amplification with respect to time. This circuitry compensates for the reduction in sensitivity with depth as a result of sound beam divergence and its attenuation in material.

1.2.6 Back Reflection or End Reflection

Reflection from the opposite side, end, or boundary of the material into which the ultrasonic energy was introduced.

1.2.7 Calibrated Gain Control (Attenuator)

Circuitry with which gain can be reduced finite amounts by switching electrical signal attenuation into the circuit.

1.2.8 Calibration

Process of comparing an instrument or device with a standard to determine accuracy or produce a scale.

1.2.9 Cathode Ray Tube (CRT)

An electron tube in which a controlled beam of electrons from the cathode is used to produce an image on a fluorescent screen at the end of the tube.

1.2.10 Couplant

Any material, usually a liquid or semiliquid, used between the search unit and the inspection surface to exclude air and to convey the ultrasonic vibrations between the search unit and the material being inspected.

1.2.11 Damping Control

Control that varies the duration of transducer ringing.

1.2.12 Decibel (dB)

Units for the logarithmic expression of the ratio of power levels. Power levels can be functions of voltage, current, or impedance, for example. Decibel units having no values of their own are only significant when a reference is stated, as 10 dB above one reference level or 6 dB below another reference level.

1.2.13 Delay Control

Means of delaying the pattern obtained on the CRT.

1.2.14 Discontinuity

Anything within a material that will cause a detectable interruption in an ultrasonic beam.

1.2.15 Distance-Amplitude Correction Curve

Curve showing the relationship between signal amplitude and equal-sized reflecting surfaces at various distances from the transducer. Reference standards are used to obtain such curves.

1.2.16 Dynamic Range

Ratio of maximum to minimum size of reflective areas that can be adequately distinguished on the CRT at a constant gain setting.

1.2.17 Effective Depth of Penetration

Maximum depth at which the sensitivity is satisfactory for the quality of test desired.

1.2.18 Examination

Within the context of this specification, is equivalent to the word "inspection."

1.2.19 Gain Control

Circuitry designed into the ultrasonic system to vary reflection amplitude. This control is usually calibrated in decibels. It is also called the sensitivity control.

1.2.20 Gross

Background displacement of the trace on the CRT from the established baseline due to the gain setting, the characteristics of the test equipment, or the material under examination.

1.2.21 Hertz

One complete set of recurrent values of a periodic quantity comprises a cycle. In other words, any one set of periodic variations starting at one condition and returning once to the same condition is a cycle.

1.2.22 Immersion Techniques

Test methods in which the part to be tested and the search units are immersed in water or other suitable liquid couplant. A mechanical device is used to firmly hold and direct the wave angle of the search unit. The search unit does not contact the item being inspected.

1.2.23 Indication

Visual presentation on the cathode ray screen resulting from a sound beam reflection from a boundary surface or discontinuity.

1.2.24 Initial Pulse Indication

Usually called the "initial pulse." A signal on the CRT screen marking the instant at which a voltage impulse is applied to the transmitting crystal. Its rising edge is frequently invisible due to the time lag in the probe shoe and the consequent necessity to ensure coincidence between the time base zero and the instant at which the transmitter pulse actually enters

the material under test.

1.2.25 Linearity

Property of an instrument revealed by a linear change in reflected signal or displacement. The vertical linearity is determined by plotting the change in ratios of signal amplitude from two adjacent reflections from an area of known size. The horizontal linearity is determined by plotting the distance the signal is displaced along the sweep against the change in material thickness or by noting the spacing of multiple back reflections.

1.2.26 Longitudinal or Compressional Waves

Simple compression-rarefaction waves in which particle motion within a material is linear and in the direction of wave propagation. Also called straight beams, or compressional or normal waves.

1.2.27 Longitudinal Wave Inspection

Ultrasonic technique, normally using straight beam methods, in which longitudinal waves are the dominant form.

1.2.28 Mid-Screen Reflection

Reflection whose amplitude is equal to one-half the usable screen height on the CRT.

1.2.29 Megahertz (MHz)

One million hertz per second frequency.

1.2.30 NDT Level I

An NDT Level I individual should be qualified to properly perform specific calibrations, specific NDT, and specific evaluations for acceptance or rejection determinations according to written instructions and to record results.

1.2.31 NDT Level II

An NDT Level II individual should be qualified to set up and calibrate equipment and to interpret and evaluate results with respect to applicable codes, standards, and specifications.

1.2.32 NDT Level III

An NDT Level III individual should be capable of establishing techniques and procedures; interpreting codes, standards, specifications, and procedures; and designating the particular NDT methods, techniques, and procedures to be used.

1.2.33 Node

Distance a shear wave travels in a straight line from the inspection surface before being reflected by the opposite surface.

1.2.34 Pulse Repetition Rate

Number of spaced pulses of sound per second sent into the material being

inspected.

1.2.35 Range Control

Means of expanding the pattern obtained on the CRT so that any portion of the total distance being tested can be presented.

1.2.36 Reference Reflector

Standard reflector 1.52 mm diameter reference hole in the IIW reference block. Other approved blocks may have a different diameter reflector.

1.2.37 Reflector

Boundary, consisting of an opposite side, crack, or separation, or a distinct change in material such as slag or porosity that reflects the ultrasonic energy the same as a mirror reflects light.

1.2.38 Refracted Waves

Waves that have undergone change of velocity and direction by passing from one material to another material with different acoustical properties. Refraction will occur wherever the angle of the incident wave to the interface is other than perpendicular.

1.2.39 Rejectable Discontinuity (Defect)

Reflector large enough to produce a signal (decibel rating) that exceeds the reject/repair line.

1.2.40 Resolution

Ability to clearly distinguish signals obtained from two reflective surfaces with a minimum separation distance. Near-surface resolution is the ability to clearly distinguish a signal from a reflector at a minimum distance under the contact or near surface without interference from the initial pulse signal. Far-surface resolution is the ability to clearly distinguish signals from reflectors displaced at minimum distances from the far or back surface when the sound beam is normal to that back surface.

1.2.41 Ringing

Excitation in a transducer due to the application of a short pulse of high voltage.

1.2.42 Scanning

Procedure of moving the search unit or units along a test surface to obtain complete inspection of the entire volume of a material being inspected. Preliminary scanning refers to a somewhat common practice of rapidly traversing a weld ultrasonically with a higher instrument gain or sensitivity level than will be used for the evaluation. It gives the operator an estimate of the welding quality and also makes all defects more prominent and less likely to be missed.

1.2.43 Search Unit

Device containing a piezoelectric material used for introducing vibrations into a material to be inspected or for receiving the vibrations reflected

from the material. The active element of the search unit is defined as the effective transmitting area. Search units are also called transducers or probes. They may be single or dual and contain one or two piezoelectric elements, respectively, for transmission and reception. The single search unit is sometimes enclosed in a transducer wheel or search unit wheel. The search unit may be manually handled and placed in direct contact with the material to be inspected or may be held in a fixture for immersion techniques.

1.2.44 Sensitivity

Measure of the ultrasonic equipment's ability to detect discontinuities. Quantitatively, it is the level of amplification of the receiver circuit in the ultrasonic instrument necessary to produce the required indication on the scope from the reference hole in the reference block. Also see "Standard Reference Level."

1.2.45 Shear Waves

Waves in which the particles within the material vibrate perpendicularly to the direction in which the wave travels or propagates. Also called transverse waves.

1.2.46 Shear Wave Inspection

Inspection technique using shear waves in a material. The search unit is placed at an angle to the contact surface of the material so the resultant refracted sound is a shear wave at an angle to the normal.

1.2.47 Standard Reference Level

Mid-screen height reflection when beaming at the 1.52 mm hole in the primary reference block or the reference hole in the secondary standard.

1.2.48 Surface Waves

Waves that propagate along the surface of the material and penetrate it to only about 1/2-wavelength. Also known as Rayleigh waves.

1.2.49 Test Frequency

Operating frequency in hertz per second of the search unit during period of activation. Frequency is usually expressed in megacycles per second or megahertz. The latter term has been adopted for international use and is preferred.

1.2.50 Video Form

Type of signal presentation on a CRT in which only the upper half of the signal appears.

1.3 GENERAL REQUIREMENTS

The procedures, methods, standards, and description of equipment specified herein shall be used for inspection of weldments. Ultrasonic inspections shall be made to detect the following defects:

- a. Cracks or crack-like faults.
- b. Root defects, including lack of penetration and fusion.
- c. Lack of fusion between passes on the sidewall.
- d. Porosity or inclusions and excessive undercutting.

1.4 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300SUBMITTAL PROCEDURES:

SD-08 Statements

Ultrasonic Inspection; GA.

Procedures and Methods. The pulse echo contact method with an A scan presentation shall be used for the ultrasonic inspection of welded joints except that immersion techniques may be used for some applications when approved by the Contracting Officer. The Contractor shall provide a standard reference block and working standards as described in paragraph REFERENCE STANDARDS FOR EQUIPMENT, QUALIFICATIONS, AND CALIBRATION. The procedures to be used for personnel and equipment qualification, equipment calibration, and inspection, shall be submitted to the Contracting Officer at least 30 days prior to their intended use. Approval by the Government will in no way affect the obligation of the Contractor to employ qualified personnel, equipment, and procedures, and to perform the inspection as specified. The procedure description shall include the following:

- a. Couplant.
- b. Search unit characteristics including angle, size, shape, nominal frequency, type designation.
- c. Method and type of wave.
- d. Equipment and accessories including manufacturer, model number, date of manufacture, last date of calibration, and the manufacturer's electrical, physical, and performance specifications.
- e. Decibel (dB) compensation system for distance-amplitude correction.

SD-18 Records

Ultrasonic Inspection; GA.

Reports containing the following information:

- a. Identification and Location of Inspected Item: Name and place of the inspected item, the person performing the inspection, and the date of inspection.
- b. Detail of Inspections: Details of methods, types of waves used, search units, frequencies, inspection equipment identification, and calibration data with enough information to permit duplication

of the inspection at a later date.

- c. Response in Calibration: The response from the DSC or SC block used in calibration and for acceptance/rejection in terms of the response from the 1.524 mm reference hole in the standard IIW block (primary standard).
- d. Identification of Unacceptable Areas: Locations, dimensions, types, and area of unacceptable defects and discontinuities giving reflections over 50 percent of the reject/repair line. These may be noted on a sketch or marked-up drawing.
- e. Record of Repair Areas: A record of repaired areas shall be furnished as well as test results for the repaired areas.

1.5 WAVE TYPES

The types of waves and the conditions under which they shall be used are specified below:

1.5.1 Shear Waves

Unless conditions prohibit, shear waves shall be used. A longitudinal wave procedure may be used instead, if approved by the Contracting Officer. Refracted waves between 40 degrees and 70 degrees shall be used except where different angles are indicated in approved procedures, such as for materials less than 13 mm thick, for materials with sound velocities greater than in steel, when the weldments are not readily accessible, or when existing backing rings or backing strips are not removed. For inspection of weldments containing backing rings or backing strips, the instrument shall be adjusted and the refracted angles shall be selected in a way to separate the weldment and the backing ring reflections. The search unit angle and the resulting shear wave angle in the material to be inspected shall be established by the Contractor for each application and this information shall be included in the procedure submitted for approval.

1.5.2 Longitudinal Waves

When conditions prohibit the use of shear waves, longitudinal waves may be used. The procedure shall be specially developed to suit the application and shall have the prior approval of the Contracting Officer.

1.6 CHANGES IN PROCEDURE

Should application of an approved procedure not provide for good resolution or adequate ultrasonic penetration in the items to be inspected (see paragraph EQUIPMENT QUALIFICATION REQUIREMENTS), changes in procedure or equipment such as frequency, pulse repetition rate, angle of search unit, couplant, or oscilloscope shall be made by the Contractor. Adequacy of the new procedure shall be demonstrated to the Contracting Officer. The Government reserves the right to require a change in test equipment during these tests if any of the following test system characteristics fall below the levels listed in paragraph EQUIPMENT QUALIFICATION REQUIREMENTS: sensitivity, amplitude and distance linearity, signal-to-noise ratio, entry and back surface resolution and penetration.

1.7 ULTRASONIC EQUIPMENT

The ultrasonic equipment shall conform to the requirements listed in AWS

D1.1 Section Inspection, subsection Ultrasonic Equipment, with the following exceptions:

- a. The ultrasonic test instruments shall be able to generate, receive, and to present pulses in the frequency range from 1 to 10 megahertz (MHz).
- b. The horizontal linearity of the ultrasonic instrument shall be measured in accordance with paragraph EQUIPMENT QUALIFICATION REQUIREMENTS.
- c. In addition to the resolution test specified in AWS D1.1, subsection Ultrasonic Equipment, both near- and far-surface resolution tests shall be conducted in accordance with the tests specified for these characteristics in the paragraph EQUIPMENT QUALIFICATION REQUIREMENTS.

1.8 PERSONNEL QUALIFICATION AND REQUIREMENTS

1.8.1 Personnel Qualification

The three levels of responsibility associated with ultrasonic inspection are defined in ASNT-01. For qualification to perform ultrasonic inspection, personnel shall be certified under ASNT-01 and ASNT-04 within a period of 1 year before the date of contract. Other qualification or certification may be accepted at the Contracting Officer's discretion. Personnel with only an operator or inspector trainee certification will not be considered qualified to pass judgement on the acceptability of inspected items, but may work under the direct supervision of a qualified ultrasonic inspector. Qualified ultrasonic inspectors shall be able to judge the acceptability of the item in accordance with paragraph ACCEPTANCE/REJECTION LIMITS.

1.8.2 Examinations

If the Contracting Officer doubts an individual's ability as an operator, inspector, or supervisor, the individual shall be recertified in accordance with ASNT-01. At the option of the Government, the Contracting Officer may participate in administering the examination and in evaluating the results.

1.9 REFERENCE STANDARDS FOR EQUIPMENT, QUALIFICATIONS, AND CALIBRATION

Reference standards shall be used to calibrate the inspection equipment, test its operating condition, and record the sensitivity or response of the equipment during the inspection in accordance with paragraph EQUIPMENT QUALIFICATION REQUIREMENTS. The standards shall comprise a standard reference block and reference specimens as noted below.

1.9.1 Standard Reference Block

The standard reference block or primary standard shall be provided by the Contractor and shall consist of the IIW block in AWS D1.1, Section Inspection, subsection Reference Standards. The standard reference block also shall be used in any reinspection on the same basis as the original inspection, even though the reinspection is to be performed by other ultrasonic instruments and accessories.

1.9.2 Working Standards

The Contractor may use other recognized working standards detailed with the IIW block in AWS D1.1 such as the Sensitivity Calibration (SC) block. However, such blocks must be referenced to the IIW block as noted in paragraph SENSITIVITY CALIBRATION OF LONGITUDINAL AND ANGLE WAVE SYSTEMS. Details of their use must be included in the procedure description submitted to the Contracting Officer. These blocks are the secondary standards. They shall be of acoustically similar material to the welds to be inspected. The secondary standards shall be suited for the applicable tests specified in paragraph EQUIPMENT QUALIFICATION REQUIREMENTS and shall be used as follows, except where the IIW block is specifically required:

- a. To assure adequate penetration of the base material.
- b. To provide a secondary field standard.
- c. To calibrate the equipment and establish the standard reference level.

1.9.3 Resolution Test Block

The Contractor shall furnish a resolution test block in accordance with the details shown in AWS D1.1 Section Inspection, subsection Ultrasonic Equipment.

1.10 EQUIPMENT QUALIFICATION REQUIREMENTS

The ultrasonic instrument and accessories shall be evaluated on their arrival at the jobsite just before the start of inspection. They shall be evaluated using the Contractor's furnished primary standard and shall meet or exceed the requirements listed in paragraphs under EQUIPMENT QUALIFICATION REQUIREMENTS. Equipment that does not meet these requirements shall not be used in the inspection.

1.10.1 Requalifications

The equipment shall be requalified after normal use at intervals not to exceed 40 hours except as noted. The equipment also shall be requalified immediately after maintenance or repair or when the Contracting Officer considers its operation questionable.

1.10.2 Longitudinal Wave System

1.10.2.1 Vertical Amplitude Linearity

Two adjacent reflections of different amplitudes obtained through the thickness of the primary or secondary standard shall vary in the same proportion as the amplitude of the first reflection is increased in discrete 2-dB increments between 20 percent and 80 percent to full screen height. For each gain setting, the amplitude of each reflection shall vary by the same factor within plus or minus 5 percent. Requalification is required monthly or as otherwise stated in paragraph EQUIPMENT QUALIFICATION REQUIREMENTS.

1.10.2.2 Horizontal Linearity

The first three multiple reflections obtained through the thickness of the primary or secondary standard shall be equally spaced within plus or minus

5 percent when spread over 90 percent of the sweep length. Requalification is required monthly or as otherwise stated in paragraph EQUIPMENT QUALIFICATION REQUIREMENTS.

1.10.2.3 Near-Surface Resolution

Excessive ringing that appears on the CRT to the right of the sound entry point is not to exceed a 13 mm equivalent distance in steel with the search unit placed on the 100 mm edge of the IIW (primary) block and positioned for maximum amplitude reflection from the 1.524 mm reference hole of the primary standard. The reference reflector shall be set to mid-screen and the gain shall be increased 20 dB. The reference hole located at least 13 mm from one edge of the AWS DSC or SC secondary standard shall be used similarly. Acceptability shall be on the same basis as in the primary standard.

1.10.2.4 Far-Surface Resolution

This property of the equipment will be verified by the method detailed in AWS D1.1, Section Inspection, subsection Calibration of the Ultrasonic Unit with the IIW or Other Approved Calibration Blocks. In addition, the trailing edge of the third reflection shall return to the sweep line and be clearly discernible.

1.10.3 Angle Wave System

1.10.3.1 Vertical (Amplitude) Linearity

Two adjacent multiple reflections from the 1.524 mm reference hole in the primary standard shall vary in the same proportion as the amplitude of the first reflection in discrete 2-dB increments between 20 percent and 80 percent of full screen height. For each gain setting, the amplitude of each adjacent reflection shall vary within plus or minus 5 percent. For testing with the AWS SC or AWS DSC secondary standard, the same criteria shall apply. For the SC block, the transducer shall be placed on the longitudinal surface contiguous with the sound entry point lines whereas the 100 mm longitudinal surface of the DSC block shall be used for the same purpose. Requalification is required monthly or as otherwise stated in paragraph EQUIPMENT QUALIFICATION REQUIREMENTS.

1.10.3.2 Horizontal Linearity

The first three multiple echoes obtained from the 1.524 mm reference hole of the primary standard or from the reference hole in a secondary standard with the transducer positioned at a minimum of 25 mm sound path distance shall be equally spaced plus or minus 5 percent when spread over 90 percent of the sweep length. The gain shall be adjusted to give a mid-screen height first reflection. Requalification is required monthly or as otherwise stated in paragraph EQUIPMENT QUALIFICATION REQUIREMENTS.

1.10.3.3 Near-Surface Resolution

The search unit shall be positioned for maximum amplitude using the primary or secondary standard as in the horizontal linearity test. The gain shall be adjusted to give a mid-screen height first reflection and then shall be increased 20 dB. Excessive ringing that appears on the CRT to the right of the sound entry point is not to exceed 13 mm equivalent distance in steel.

1.10.3.4 Far-Surface Resolution

The equipment shall delineate the three resolution holes in the resolution block appropriate for the angle of the transducer to be used in the inspection.

1.10.3.5 Signal-to-Noise Ratio

With the search unit located as in the horizontal linearity test, the gain shall be set to obtain an 80 percent full screen height first reflection. The reference reflection-to-noise-amplitude ratio shall not be less than 10 to 1.

1.10.3.6 Exit Point

The search unit shall be placed on the graduated scale on the 300 mm edge of the primary standard and the ultrasound shall be beamed toward the curved edge of the block. The gain shall be set for a mid-screen first reflection. The search unit shall be moved back and forth until the first reflection is maximized. The index line on the side of the search unit shall be within 1.6 mm of the mid-point of the graduated scale in either direction. Requalification is required after 40 hours or as otherwise stated in paragraph EQUIPMENT QUALIFICATION REQUIREMENTS.

1.10.3.7 Transducer Angle

The established exit point of the probe shall be set over the applicable angle index line scribed on the 200 mm or 300 mm edge, as appropriate, of the primary standard. The gain shall be set to obtain a mid-screen first reflection from the 50 mm plexiglass-lined hole for search units up to 70 percent with the search unit placed on the 200 mm edge. Search units of large angles that have been approved specifically by the Contracting Officer shall be tested from the 300 mm edge using the 1.524 mm reference hole. The search unit shall be moved back and forth to maximize the first reflection. When the material to be inspected is not acoustically similar to the primary standard, the inspection angle shall be within plus or minus 2 degrees of the angle specified in the approved procedure. Requalification is required after 40 hours or as otherwise stated in paragraph EQUIPMENT QUALIFICATION REQUIREMENTS.

1.11 SENSITIVITY CALIBRATION OF LONGITUDINAL AND ANGLE WAVE SYSTEMS

Sensitivity calibration shall be done immediately after a change of operators and at least every 30 minutes thereafter as testing proceeds. Recalibration shall also be required after any power interruption, including a change of source, when the equipment is suspected of being in error, or after relocation of the jobsite. The 30-minute and relocation calibrations may coincide. Before calibration, the instrument shall be allowed to warm up before calibration is attempted. The instrument range and delay controls shall be adjusted to display signals from the reference hole in the primary (IIW block) or secondary standard (DSC or SC block or both) on the viewing screen for the range of distances to be inspected.

1.11.1 Calibration Procedure

The test instrument shall be calibrated as described below.

1.11.1.1 Longitudinal Wave System

In calibrating with the primary standard, the transducer shall be

positioned on the 100 mm edge for maximum reflection from the 1.524 mm reference hole. The gain shall be adjusted so that the first reflection is at 50 percent full scale. The top of that indication shall be marked on the CRT with a wax pencil or by other means. This establishes the standard reference level. A point at 80 percent of the standard reference level shall be calculated and marked. This locates the reject/repair line. If a secondary standard is to be used in the inspection, the reject/repair line will be established similarly. For the DSC block, the transducer shall be positioned on the 100 mm long surface and with the SC degrees sound entry point lines. Adjustment for loss of signal due to distance shall be compensated for as noted in paragraph SENSITIVITY CALIBRATION OF LONGITUDINAL AND ANGLE WAVE SYSTEMS.

1.11.1.2 Angle Wave System

In calibrating with either the primary or secondary standard, the transducer shall be positioned on the same surfaces as in the case of the longitudinal wave system but over the sound entry point lines appropriate for the angle of the transducer to be used in the inspection. The gain shall be adjusted to give a first reflection that is 50 percent of full-scale response. The top of that indication shall be marked with a wax pencil or by other means. This establishes the standard reference level. A point at 80 percent of the standard reference level shall be calculated and marked. This locates the reject/repair line. Loss of signal shall be compensated as noted in paragraph SENSITIVITY CALIBRATION OF LONGITUDINAL AND ANGLE WAVE SYSTEMS.

1.11.2 Calibration of the Secondary Standards

After adjusting the first reflection from the reference hole in the secondary standard to 50 percent full-scale response for a shear or longitudinal wave inspection, a maximized reflection from the 1.524 mm reference hole in the primary standard shall be obtained without changing the gain setting. Then this gain setting shall be readjusted to obtain a 50 percent full-scale reflection and the readjusted setting shall be recorded as required by paragraph SUBMITTALS, Records, to provide a basis for recalibration when the secondary standard is unavailable.

1.11.3 Equipment With a Calibrated Gain Control (Attenuator)

When a calibrated gain control attenuator is used, the transducer shall be positioned for a maximum reflection from the reference hole in the secondary standard representing approximately 1/2 the longest inspection distance. This reflection shall be adjusted to mid-scale by varying the gain control accordingly. The difference in decibels between this amplitude and the signal obtained from the first, second, and longest distance reflection obtainable on the secondary standard shall be measured. The differences shall be recorded and plotted on a curve to determine the necessary correction to the amplitude at the various inspection distances. A level (80 percent of the primary level) obtained from the corrected signal heights is equivalent to the reject/repair line.

1.11.4 Equipment With Electronic Distance Compensation Circuitry

If the difference in amplitude between the first reflection and the reflection obtained from the maximum inspection distance is 1 dB or less, the instrument may be used as is. If not, the procedure used for equipment with a calibrated decibel control must be used to determine the necessary correction to the reflections obtained at the various inspection distances.

This characteristic of the equipment must be reexamined on a monthly basis or as otherwise stated in paragraph EQUIPMENT QUALIFICATION REQUIREMENTS and correction factors must be modified accordingly.

1.11.5 Longitudinal Wave Distance-Amplitude Correction Curve

A distance-amplitude correction curve may be used instead of the calibrated gain control or the electronic circuitry for either the shear or longitudinal wave system as described below:

- a. A shear wave distance-amplitude correction curve shall be constructed and drawn on the face of the cathode ray tube (CRT) for inspection of weldments in excess of 38 mm thick when the design of the test equipment permits. The reference hole in the secondary standard SC or DSC shall be used to construct the distance-amplitude correction curve for a minimum of three node points, 1, 2, and 3. The sensitivity of the instrument shall be adjusted to produce 50 percent full-scale response for the maximized primary reflection and the reject/repair line shall be constructed at 80 percent of the established distance-amplitude curve.
- b. A longitudinal wave distance-amplitude correction curve shall be constructed and drawn on the face of the CRT when longitudinal waves are to be used in the inspection for material thicknesses exceeding 25 mm, if design of the test equipment permits. The reference hole in the secondary standard shall be used. Instrument sensitivity shall be adjusted to 50 percent full-scale of the maximized response from the reference hole at 1/2-maximum inspection distance. A reject/repair line shall be constructed at 80 percent of the established distance-amplitude curve. The reflection amplitudes to define this curve shall be taken from the faces of the secondary sensitivity standards which are 25 mm, 50 mm, and 1/2-maximum inspection distance, and the longest distance obtainable from the secondary standard, respectively, from the reference hole. When a correction curve cannot be drawn on the face of the CRT, one of the distance-amplitude correction methods noted above and submitted under the procedure description in accordance with paragraph GENERAL REQUIREMENTS shall be applied.

1.11.6 Longitudinal Wave Inspections Using Immersion Technique

The reference hole in a secondary standard shall be used for each different inspection distance. Repair/reject limits shall be established by immersing both the search unit and secondary standard in the liquid bath in which the inspection is to be conducted. The procedure noted below shall be used:

- a. The longitudinal waves from the search unit shall be directed toward the face of the secondary standard closest to the reference hole.
- b. The search unit shall be positioned for maximum response. The amplitude of reflection shall be adjusted to 50 percent full-scale. The top of that indication shall be marked on the CRT with a wax pencil or by other means. This establishes the standard reference level. A point at 80 percent of the standard reference level shall be calculated and marked. This locates the reject/repair point. The above shall be repeated for each

different surface-to-hole distance to establish the reject/repair line.

- c. With the gain at the same setting and the primary standard and search unit in air, a maximized reflection shall be obtained from the 1.524 mm reference hole in the primary standard (IIW). Then, this gain setting shall be readjusted to obtain a 50 percent full-scale reflection. The readjusted setting shall be recorded as required by paragraph SUBMITTALS, Records, to provide a basis for recalibration when the secondary standard is unavailable.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 PREPARATION OF MATERIALS FOR INSPECTION

Surfaces shall be free from the following:

3.1.1 Weld Spatter

Spattering or any roughness that interferes with free movement of the search unit or impairs transmission of the ultrasonic vibrations.

3.1.2 Irregularities

Those which could mask or be confused with defect indications.

3.1.3 Weld Backing Strips

Strips that are not to remain in place shall be removed and all sharp edges and valleys shall be eliminated by grinding or other mechanical means.

3.1.4 Dirt

All loose scale, rust, paint, and dirt shall be removed from the coupling surface.

3.2 INSPECTION PROCEDURE

When possible, all welds shall be examined from both sides of the weld and from one surface. If complete inspection cannot be accomplished from one surface, inspection shall be made from another surface that is part of the same joint. Preliminary scanning techniques using an increased instrument gain shall be used to locate possible defects. When possible, gain shall be increased to a minimum of twice (6 dB) the reference level setting. Final acceptance or rejection shall be evaluated with the equipment properly calibrated and the gain control set at the reference level. The reject/repair line shall be used to evaluate quality of the weld. If a periodic calibration check shows that the equipment is not operating properly or that the system's sensitivity has decreased more than 20 percent (2 dB) from the established sensitivity level, all welds inspected since the prior calibration shall be reexamined. If penetration of the shear waves is questionable, the angle search unit shall be placed in position on one side of the weldment with the waves directed through the weldment. A disconnected angle search unit, plastic or metal wedge or disk, or any good reflector shall be placed in the wave path of the search unit on the far side of the weld to reflect the sound. When good reflections cannot be obtained by either shear or longitudinal waves, the

Contractor shall modify the procedures in accordance with paragraph GENERAL REQUIREMENTS.

3.2.1 Test Frequency

The test frequency for ferrous materials shall be as specified in AWS D1.1, Section Inspection, subsection Ultrasonic Equipment, except for thicknesses below 13 mm, frequencies between 2.25 and 5 MHz may be used to obtain increased sensitivity. For materials that are difficult to penetrate, any frequency within the operating range of the equipment may be used. The effective depth of penetration and sound beam divergency shall be demonstrated to the Contracting Officer.

3.2.2 Couplants

The choice of couplant is optional with the Contractor except as follows:

- a. The couplant shall be the same as that used for equipment qualification and calibration.
- b. Couplants that may corrode the reference standards and material being tested or leave objectionable residues shall not be used.
- c. Oils shall not be used in systems intended to handle liquid oxygen.
- d. Couplants shall be of the proper viscosity to give good coupling for the surface roughness.

3.2.3 Shear Wave Inspection

Shear wave inspection shall be performed as follows: The search unit shall be placed on the contact surface at a distance from the weld equal to that used when calibrating the equipment.

3.2.4 Longitudinal Flaws

To detect longitudinal flaws, the search unit shall be slowly moved toward and away from the weld far enough to cover its entire cross section, approximately 90 degrees to the weld centerline. The search unit shall be radially oscillated to the left and right, covering an angle of approximately 30 degrees. During the foregoing movement, the search unit shall be continually advanced parallel to the weld centerline. The rate of movement shall depend on the operator's ability to clearly see and identify all reflections. The amount of movement shall be calculated to insure that the inspection distance will be great enough to traverse the weld. For plate thicknesses 50 mm and greater with an unmachined stainless steel overlay covering the welded joint, the inspection distance shall range from a minimum of one thickness (T) or the first node back from the near fusion line to a distance exceeding T plus 2/3, the maximum width of the weld deposit at the surface. The inspection shall be repeated from the other side of the weld on the same surface if accessible or if not, from another surface that is part of the same joint as indicated above. The surface of the weld metal in the joint shall be ground smooth and blended with the base metal.

3.2.5 Transverse Flaws

To detect transverse flaws when the welded surface is ground flush, the search unit shall be moved along the welded surface in each direction

parallel to the centerline of the weld metal with the wave radiating parallel to the weld centerline. To detect transverse flaws when the welded surface is not ground flush, the search unit shall be moved parallel to the weld in each direction, on the adjacent base metal at the top of the weld, with the wave directed at an angle of 30 degrees to the weld centerline.

3.2.6 Longitudinal Wave Inspection

This inspection shall be made as follows:

- a. The search unit shall be placed on the contact surface with the wave directed in a straight line through any intervening base metal and through the weldment.
- b. The search unit shall then be moved slowly in a direction parallel to the weld centerline and zigzagged across an area equivalent to the welded thickness to make sure that waves penetrate the entire welded cross section.
- c. The rate of movement shall be dependent on the operator's ability to clearly see and identify all reflections.

3.3 GENERAL ACCEPTANCE/REJECTION REQUIREMENTS

Discontinuities shall be evaluated only when the ultrasonic equipment is calibrated properly. If discontinuities are detected, the sound beam shall be directed to maximize the signal amplitude. To determine the length of a discontinuity, the search unit shall be moved parallel to the discontinuity axis in both directions from the position of maximum signal amplitude. One-half the amplitude or a 6-dB increase in sensitivity from a point at which the discontinuity signal drops rapidly to the baseline shall be defined as the extremity of the discontinuity. At this point, the scanning surface shall be marked at the position indicated by the center of the transducer. This shall be repeated to determine the other extremity. The length of the discontinuity shall be defined as the distance between these two marks. For discontinuities with signal amplitudes exceeding full screen height, 50 percent of full screen shall be considered half-peak amplitude. At this point, the scanning surface shall be marked at the position indicated by the center of the transducer. This shall be repeated to determine the other extremity. The length of the discontinuity shall be defined as the distance between these two marks. The maximum signal amplitude, length, depth, and position within the inspection zone shall be determined and reported for discontinuities yielding a signal amplitude equal to or exceeding the reject/repair line. The minimum recordable length of a discontinuity shall be 3 mm. When evaluating welds joining two members with different thicknesses at the weld, the thickness T shall be the lesser of the two thicknesses. The criteria for acceptance or rejection based on ultrasonic inspection will supplement a visual inspection. The sizes and surface conditions of the welds shall conform to the requirements indicated on the applicable plans and drawings and other sections of the specification.

3.3.1 Investigation of Questionable Indications

An indication considered doubtful shall be brought to the attention of the Contracting Officer and, at the Contractor's option, the weld shall be repaired or investigated further. Indications detected within 10 mm of accessible surfaces shall be investigated further using liquid penetrant in

accordance with ASTM E 165 or magnetic particle methods in accordance with ASTM E 709, as applicable, to determine if the surface is penetrated. Failure to locate the flaws by one of these methods shall necessitate further investigation by the other. For nonmagnetic materials, only dye penetrant inspection is required. Other questionable defects shall be further investigated using modifications of the inspection procedure in accordance with paragraph GENERAL REQUIREMENTS.

3.3.2 Inspection of Repairs

All repairs shall undergo the same inspection procedure that originally revealed the discontinuities. Before acceptance, the welds shall meet the standards required for the original weld.

3.4 ACCEPTANCE/REJECTION LIMITS

Welds shall be accepted or rejected by ultrasonic indication in accordance with the following:

3.4.1 Full Penetration Butt Welds and Corner Welds

3.4.1.1 Class I

Welds shall be rejected on the basis of the following:

- a. Any evidence of a crack, including any revealed by dye penetrant or magnetic particle in accordance with paragraph GENERAL ACCEPTANCE/ REJECTION REQUIREMENTS.
- b. Any indication of a discontinuity such as excessive undercutting, lack of fusion, incomplete penetration, inclusions, or porosity which individually or collectively produce reflections equal to or greater than the established reject/repair line.
- c. Any discontinuity with a reflection equal to or exceeding 25 percent of the reject/repair line up to and including the reject/repair line shall be rejected where the discontinuity length exceeds $1/2 T$ or 25 mm.
- d. Adjacent discontinuities separated by sound metal with the dimension less than twice the length of the longest discontinuity shall be considered a single discontinuity. The maximum distance between the outer extremities of any two such discontinuities or the sum of their lengths, whichever is greater, shall not exceed the limits specified.
- e. If the total cumulative length of the discontinuities in any 300 mm of weld length exceeds T , that weld length shall be rejected.

3.4.1.2 Class II

Welds shall be rejected on the basis of the following:

- a. Any evidence of a crack, including those revealed by dye penetrant or magnetic particle inspection in accordance with paragraph GENERAL ACCEPTANCE/REJECTION REQUIREMENTS.
- b. Any discontinuity with a reflection exceeding the established reject/repair line and with a length exceeding 6 mm. Adjacent discontinuities separated by sound metal with the dimension less

than twice the length of the longest discontinuity shall be considered a single discontinuity.

- c. Any discontinuity with a reflection equal to or exceeding 50 percent of the reject/repair line up to and including the reject/repair line shall be rejected if the discontinuity length exceeds T. In no case shall any single discontinuity length exceed 38 mm.
- d. Adjacent discontinuities separated by sound metal with the dimension less than twice the length of the longest discontinuity shall be considered a single discontinuity. The maximum distance between the outer extremities of any two adjacent discontinuities or the sum of their lengths, whichever is greater, shall not exceed the length as specified above.
- e. If the total cumulative length of discontinuities in any 300 mm of weld length exceeds 2 T, that weld length shall be rejected.

3.4.1.3 Class III

Welds shall be rejected on the basis of the following:

- a. Any discontinuity with a reflection exceeding the established reject/repair line and with a length exceeding 13 mm. Adjacent discontinuities separated by sound metal with a dimension less than twice the length of the longest discontinuity shall be considered a single discontinuity.
- b. Any discontinuity with a reflection equal to or exceeding 50 percent of the reject/repair line or with the level 8 dB more than the reject/repair line and with a length (L) exceeding 50 mm or LT, whichever is greater.
- c. If the total cumulative length of discontinuities in any 300 mm of weld length exceeds 75 mm or 2 T, whichever is greater, that weld length shall be rejected.

3.4.2 Full Penetration Tee Welds

Full Penetration Tee Welds (for Incomplete Root Penetration): Any discontinuity with the reflection exceeding the established reject/repair line of the applicable class shall be rejected. Any discontinuity with a reflection exceeding 25 percent of the established reject/repair line up to and including the reject/repair line shall be rejected if its length exceeds $1/2$ T in a direction transverse to the axis of the weld or LT parallel to the axis for all classes. If the total cumulative length of discontinuities in any 300 mm of weld length exceeds the limits of the applicable class, that weld length shall be rejected.

3.4.3 Partial and Full Penetration Tee Welds

Partial and Full Penetration Tee Weld Boundaries: The depth of weld penetration and weld cross section width at the through member surface shall be as indicated by applicable plans or drawings. Limits of discontinuities shall be as specified in preceding paragraphs.

3.4.4 Tee Weld Discontinuities

Such discontinuities extending into the through member shall be rejected if reflection exceeds the established reject/repair line.

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SECTION 05120
STRUCTURAL STEEL

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC-01	(1993) Load & Resistance Factor Design Manual Vol. 1 - Structural Members, Specifications, and Codes
AISC-02	(1993) Load & Resistance Factor Design Manual Vol. II - Connections
AISC-04	(1989) Specification for Structural Steel Buildings - Allowable Stress Design and Plastic Design
AISC S303	(1992) Code of Standard Practice for Steel Buildings and Bridges
AISC S329	(1986) Allowable Stress Design Specification for Structural Joints Using ASTM A325 or ASTM A490 Bolts

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 6	(1993b) General Requirements for Rolled Steel Plates, Shapes, Sheet Piling, and Bars for Structural Use
ASTM A 36	(1993a) Structural Steel
ASTM A 307	(1993a) Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
ASTM A 325	(1993) Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength

ASTM A 563 (1993) Carbon and Alloy Steel Nuts

ASTM F 436 (1993) Hardened Steel Washers

ASTM F 844 (1990) Washers, Steel, Plain (Flat),
Unhardened for General Use

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B46.1 (1985) Surface Texture (Surface Roughness,
Waviness and Lay)

AMERICAN WELDING SOCIETY (AWS)

AWS A2.4 (1993) Standard Symbols for Welding,
Brazing and Nondestructive Examination

AWS D1.1 (1994) Structural Welding Code - Steel

STEEL STRUCTURES PAINTING COUNCIL (SSPC)

SSPC Paint 25 (1991) Red Iron Oxide, Zinc Oxide, Raw
Linseed Oil and Alkyd Primer (without Lead
and Chromate Pigments)

1.2 GENERAL REQUIREMENTS

Structural steel fabrication and erection shall be performed by an organization experienced in structural steel work of equivalent magnitude. The Contractor shall be responsible for correctness of detailing, fabrication, and for the correct fitting of structural members. Connections, for any part of the structure not shown on the contract drawings, shall be considered simple shear connections and shall be designed and detailed in accordance with pertinent provisions of AISC-01 and AISC-02. Substitution of sections or modification of connection details will not be accepted unless approved by the Contracting Officer. AISC-04 with pertinent provisions of AISC-01 and AISC-02 shall govern the work. Welding shall be in accordance with AWS D1.1. High-strength bolting shall be in accordance with AISC S329.

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL PROCEDURES:

SD-04 Drawings

Structural Steel System; GA. Structural Connections; GA.

Shop and erection details including members (with their connections) not shown on the contract drawings. Welds shall be indicated by standard welding symbols in accordance with AWS A2.4.

SD-08 Statements

Erection; GA.

Erection plan of the structural steel framing required. Erection plan shall conform to the requirements of AISC S303, shall be submitted prior to erection, and shall describe all necessary temporary supports, including the sequence of installation and removal.

SD-13 Certificates

Mill Test Reports; GA.

Certified copies of mill test reports for structural steel, structural bolts, nuts, washers and other related structural steel items.

Welder Qualifications; GA.

Certified copies of welder qualifications test records showing qualification in accordance with AWS D1.1.

Fabrication; GA.

A copy of the AISC certificate indicating that the fabrication plant meets the specified structural steelwork category.

SD-14 Samples

High Strength Bolts and Nuts; FIO. Carbon Steel Bolts and Nuts; FIO. Nuts Dimensional Style; FIO. Washers; FIO.

Random samples of bolts, nuts, and washers as delivered to the job site if requested, taken in the presence of the Contracting Officer and provided to the Contracting Officer for testing to establish compliance with specified requirements.

1.4 STORAGE

Material shall be stored out of contact with the ground in such manner and location as will minimize deterioration.

PART 2 PRODUCTS

2.1 STRUCTURAL STEEL

2.1.1 Carbon Grade Steel

Carbon grade steel shall conform to ASTM A 36.

2.2 HIGH STRENGTH BOLTS AND NUTS

High strength bolts shall conform to ASTM A 325, Type 1 with carbon steel nuts conforming to ASTM A 563, Grade C .

2.3 CARBON STEEL BOLTS

Carbon steel bolts shall conform to ASTM A 307, Grade A with carbon steel nuts conforming to ASTM A 563, Grade A.

2.4 NUTS DIMENSIONAL STYLE

Carbon steel nuts shall be Hex Style when used with ASTM A 307 bolts or Heavy Hex style when used with ASTM A 325 bolts.

2.5 WASHERS

Plain washers shall conform to ASTM F 844. Other types, when required, shall conform to ASTM F 436.

2.6 PAINT

Paint shall conform to SSPC Paint 25.

PART 3 EXECUTION

3.1 FABRICATION

Fabrication shall be in accordance with the applicable provisions of AISC-04.

Fabrication and assembly shall be done in the shop to the greatest extent possible. The fabricating plant shall be certified under the AISC quality certification program for Category I structural steelwork. Compression joints depending on contact bearing shall have a surface roughness not in excess of 12.7 micrometer as determined by ASME B46.1, and ends shall be square within the tolerances for milled ends specified in ASTM A 6. Structural steelwork, except surfaces of steel to be encased in concrete, surfaces to be field welded, surfaces to be fireproofed, and contact surfaces of friction-type high-strength bolted connections shall be prepared for painting in accordance with the AISC-04 and primed with the specified paint.

3.2 ERECTION

Erection of structural steel shall be in accordance with the applicable provisions of AISC-04.

3.2.1 Connections

Anchor bolts and other connections between the structural steel and foundations shall be provided and shall be properly located and built into connecting work.

3.2.2 Base Plates and Bearing Plates

Column base plates for columns and bearing plates for beams, girders, and similar members shall be provided. Base plates and bearing plates shall be provided with full bearing after the supported members have been plumbed and properly positioned, but prior to placing superimposed loads. Separate setting plates under column base plates will not be permitted. The area under the plate shall be damp-packed solidly with bedding mortar, except

where nonshrink grout is indicated on the drawings. Bedding mortar and grout shall be as specified in Section 03300 CONCRETE FOR BUILDING CONSTRUCTION.

3.2.3 Field Welded Connections

Field welded structural connections shall be completed before load is applied.

3.2.4 Field Priming

After erection, the field bolt heads and nuts, field welds, and any abrasions in the shop coat shall be cleaned and primed with paint of the same quality as that used for the shop coat.

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SECTION 05500

MISCELLANEOUS METAL

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ALUMINUM ASSOCIATION (AA)

AA DAF-45	(1980) Designation System for Aluminum Finishes
AA SAA-46	(1978) Standards for Anodized Architectural Aluminum

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A14.3	(1992) Ladders - Fixed - Safety Requirements
ANSI MH28.1	(1982) Design, Testing, Utilization, and Application of Industrial Grade Steel Shelving

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 36	(1994a) Carbon Structural Steel
ASTM A 53	(1993a) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
ASTM A 123	(1989a) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 283	(1993a) Low and Intermediate Tensile Strength Carbon Steel Plates
ASTM A 467	(1993) Machine and Coil Chain
ASTM A 475	(1989) Zinc-Coated Steel Wire Strand
ASTM A 500	(1993) Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A 653	(1994) Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A 924	(1994) General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip

Process

ASTM B 26	(1995) Aluminum-Alloy Sand Castings
ASTM B 221	(1995a) Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
ASTM B 429	(1995) Aluminum-Alloy Extruded Structural Pipe and Tube
ASTM D 2047	(1993) Static Coefficient of Friction of Polish-Coated Floor Surfaces as Measured by the James Machine

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1	(1994) Structural Welding Code - Steel
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NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)

NAAMM MBG 531	(1988; MBG 531S-89) Metal Bar Grating Manual
NAAMM MBG 532	(1988) Heavy Duty Metal Bar Grating Manual

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 211	(1992) Chimneys, Fireplaces, Vents and Solid Fuel-Burning Appliances
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1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL PROCEDURES:

SD-04 Drawings

Miscellaneous Metal Items; FIO.

Detail drawings indicating material thickness, type, grade, and class; dimensions; and construction details. Drawings shall include catalog cuts, erection details, manufacturer's descriptive data and installation instructions, and templates. Detail drawings for the following items: Ventilator shaft pipes, Lock and latch assemblies, Security grates, door binders, Stair railings, All imbed plates in concrete, Gravity vent. access door and accessories, air shaft access door and accessories, Winch cart/rail an accessories, Trench cover plates and accessories, Door and dock bumpers, Electric winch complete with gears, controls, and accessories as indicated, and Mechanical room floor gratings.

SD-14 Samples

Miscellaneous Metal Items; FIO.

Samples of the following items: Lock and latch assemblies complete, door and dock bumpers, Winch cart track section with wheel stop, Winch cart

wheel with axle and bearing, Winch cable section and hook, rear wall eye bolt and assembly, trench cover plate complete with hinges, Weep hole, trench drain and footing drain pipes and grates, Stair railing with elbow and tee connection, Inverted "V" rail section with rail stop, Inverted "V" rail section with complete hinged rail assembly and accessories attached, Ventilator shaft pipe complete, Air shaft access door complete, Typical imbed plate and anchors, Door binder section, Gravity vent access door complete and Fire extinguisher cabinets. Samples shall be full size, taken from manufacturer's stock, and shall be complete as required for installation in the structure. Samples may be installed in the work, provided each sample is clearly identified and its location recorded.

1.3 GENERAL REQUIREMENTS

The Contractor shall verify all measurements and shall take all field measurements necessary before fabrication. Welding to or on structural steel shall be in accordance with AWS D1.1. Items specified to be galvanized, when practicable and not indicated otherwise, shall be hot-dip galvanized after fabrication. Galvanizing shall be in accordance with ASTM A 123, ASTM A 653, or ASTM A 924, as applicable. Exposed fastenings shall be compatible materials, shall generally match in color and finish, and shall harmonize with the material to which fastenings are applied. Materials and parts necessary to complete each item, even though such work is not definitely shown or specified, shall be included. Poor matching of holes for fasteners shall be cause for rejection. Fastenings shall be concealed where practicable. Thickness of metal and details of assembly and supports shall provide strength and stiffness. Joints exposed to the weather shall be formed to exclude water.

1.4 DISSIMILAR MATERIALS

Where dissimilar metals are in contact, or where aluminum is in contact with concrete, mortar, masonry, wet or pressure-treated wood, or absorptive materials subject to wetting, the surfaces shall be protected with a coat of bituminous paint or asphalt varnish.

1.5 WORKMANSHIP

Miscellaneous metalwork shall be well formed to shape and size, with sharp lines and angles and true curves. Drilling and punching shall produce clean true lines and surfaces. Welding shall be continuous along the entire area of contact except where tack welding is permitted. Exposed connections of work in place shall not be tack welded. Exposed welds shall be ground smooth. Exposed surfaces of work in place shall have a smooth finish, and unless otherwise approved, exposed riveting shall be flush. Where tight fits are required, joints shall be milled. Corner joints shall be coped or mitered, well formed, and in true alignment. Work shall be accurately set to established lines and elevations and securely fastened in place. Installation shall be in accordance with manufacturer's installation instructions and approved drawings, cuts, and details.

1.6 ANCHORAGE

Anchorage shall be provided where necessary for fastening miscellaneous metal items securely in place. Anchorage not otherwise specified or indicated shall include slotted inserts made to engage with the anchors, expansion shields, and power-driven fasteners when approved for concrete; toggle bolts and through bolts for masonry; machine and carriage bolts for steel; and lag bolts and screws for wood.

PART 2 PRODUCTS

2.1 SHOP PAINTING

Surfaces of ferrous metal except galvanized surfaces, shall be cleaned and shop coated with the manufacturer's standard protective coating unless otherwise specified. Surfaces of items to be embedded in concrete shall not be painted. Items to be finish painted shall be prepared according to manufacturer's recommendations or as specified.

2.2 ACCESS DOORS AND PANELS

Doors and panels shall be flush type unless otherwise indicated. Frames for access doors shall be fabricated of not lighter than 1.519 mm (16 gauge) steel with welded joints and finished with anchorage for securing into construction. Access doors shall be a minimum of 350 by 500 mm (14 by 20 inches) and of not lighter than 1.897 mm (14 gauge) steel, with stiffened edges, complete with attachments. Access doors shall be hinged to frame and provided with a flush face, screw driver operated latch. Exposed metal surfaces shall have a shop applied prime coat.

2.3 FLOOR GRATINGS AND FRAMES

Carbon steel grating shall be designed in accordance with NAAMM MBG 531 for 976 kg/sm (200 psf) to . Edges shall be banded with bars 6 mm (1/4 inch) less in height than bearing bars for grating sizes above 19 mm (3/4 inch). Banding bars shall be flush with the top of bearing grating. Frames shall be of welded steel construction finished to match the grating. Floor gratings and frames shall be galvanized after fabrication.

2.4 TRENCH COVER PLATES

Trench cover plates shall be 12 mm (1/2 inch) thick, raised thread steel, unless otherwise noted. Trench plates shall be galvanized, conforming with ASTM A 283 having a minimum static coefficient of friction of 0.50 when tested in accordance with ASTM D 2047. Wearing surface shall be aluminum oxide or silicon carbide. Hinges and rods shall be stainless steel.

2.5 HANDRAILS

Handrails shall be designed to resist a concentrated load of 890 N (200 pounds) in any direction at any point of the top of the rail or 292 Newtons per meter (20 pounds per foot) applied horizontally to top of the rail, whichever is more severe.

2.5.1 Steel Handrails, Including Carbon Steel Inserts

Steel handrails, including inserts in concrete, shall be steel pipe conforming to ASTM A 53. Steel railings shall be 40 mm (1-1/2 inch) nominal size. Railings shall be hot-dip galvanized. Pipe collars shall be hot-dip galvanized steel.

- a. Fabrication: Joint posts, rail, and corners shall be fabricated by one of the following methods:

- (1) Flush type rail fittings of commercial standard, welded and ground smooth with railing splice locks secured with 10 mm (3/8 inch) hexagonal recessed-head setscrews.

(2) Mitered and welded joints by fitting post to top rail and intermediate rail to post, mitering corners, groove welding joints, and grinding smooth. Railing splices shall be butted and reinforced by a tight fitting interior sleeve not less than 150 mm (6 inches) long.

(3) Railings may be bent at corners in lieu of jointing, provided bends are made in suitable jigs and the pipe is not crushed.

- b. Removable sections, toe-boards, and brackets shall be provided as indicated.

2.6 LADDERS

Ladders shall be steel, fixed rail type in accordance with ANSI A14.3.

2.7 MISCELLANEOUS

Miscellaneous plates and shapes for items that do not form a part of the structural steel framework, such as lintels, sill angles, miscellaneous mountings, and frames, shall be provided to complete the work.

2.8 SAFETY NOSING

Safety nosings shall be of cast iron with cross-hatched , abrasive surface. Nosing shall be 75 mm (3 inches) wide and terminating at not more than 150 mm from the ends of treads. Safety nosings shall be provided with anchors not less than 19 mm (3/4 inch) long. Integrally cast mushroom anchors are not acceptable.

2.9 STEEL DOOR FRAMES

Steel door frames built from structural shapes shall be neatly mitered and securely welded at the corners with all welds ground smooth. Jambs shall be provided with 50 by 6 by 300 mm (2 by 1/4 by 12 inch) bent, adjustable metal anchors spaced not over 760 mm (2 feet 6 inches) on centers unless otherwise noted. Provision shall be made to stiffen the top member for all spans over 900 mm. The bottom of the frames shall be secured to the slab by means of angle clips and epoxy anchors unless otherwise noted. Continuous door stops shall be made as indicated.

2.10 TRENCH FRAMES, AND LINERS

Trench frames and anchors shall be all welded steel construction designed to match cover. Frames shall finish flush with the floor. Trench frames shall be galvanized after fabrication.

2.11 FIRE EXTINGUISHER CABINETS

Provide fire extinguisher cabinets for 10A60BC fire extinguishers. These cabinets shall be surface mounted. Cabinet box shall be 1.3106 mm (18 gauge) steel with a baked enamel finish. Steel door and trim shall be one-piece construction with a continuous hinge. Trim shall be rolled edge and finished in red baked enamel. Door shall be 16 mm (5/8 inch) thick, one-piece hollow steel, full glazed steel frame with rubber roller catch and satin finish door handle, and have a red baked enamel finish.

2.12 DOCK BUMPERS

Dock Bumpers shall be fabricated from rubberized-fabric truck tires cut to uniform size pads and punched to receive 19 mm (3/4 inch) supporting rods. Bumpers must be closed with two (2) 76 by 64 by 6 mm (3 by 2-1/2 by 1/4 inch) galvanized steel angles under 681 kg (1,500 pound) pressure. Angles shall be welded to 19 mm (3/4 inch) rods at one end and closed with threaded rod and nut at the other end. Anchor leg of angle shall extend a minimum of 64 mm (2-1/2 inches) beyond rubber surface at either end and contain a minimum of two (2) 21 mm (13/16 inch) anchor bolt holes each side.

2.13 WINCH CART/RAIL AND ACCESSORIES

Winch cart/rail and accessories shall be all welded steel construction galvanized after fabrication. The single flange car wheels shall be provided with roller bearings with a 76 mm (3 inch) minimum bore designed to be manually moved by a maximum horizontal start up force of 34 kg (75 pounds).

2.14 ELECTRIC WINCH

Provide electric winch complete with reduction gears and electrical controls as indicated. Winch shall have 4086 kg (9,000 pound) pull at last wrap of drum and 3,048 to 6,096 mm (10 to 20 feet) per minute speed with 16 mm (5/8 inch) diameter by 38,100 mm (125 foot) high strength plow steel cable and hook with 3 X factor of safety for cable and hook. Provide automatic roll up reel for electrical cord.

2.15 BIRD CONTROL

Provide 302 Stainless Steel 100mm wide by 95mm high with min. 6mm wide base strip. Shall have flexible needles 120 per 300mm and come in 300mm length. Stainless steel mounting clips and hardware as specified by manufacturer. Cut strips to follow all contours and angles closely.

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

All items shall be installed at the locations shown and according to the manufacturer's recommendations. Items listed below require additional procedures as specified.

3.2 ATTACHMENT OF HANDRAILS

Toeboards and brackets shall be installed where indicated. Splices, where required, shall be made at expansion joints. Removable sections shall be installed as indicated.

3.2.1 Installation of Steel Handrails

Installation shall be in pipe sleeves embedded in concrete and filled with molten lead or sulphur with anchorage covered with standard pipe collar pinned to post. Rail ends shall be secured by steel pipe flanges anchored by epoxy anchors and bolts.

3.3 INSTALLATION OF SAFETY NOSINGS

Nosing shall be completely embedded in concrete before the initial set of

the concrete occurs and shall finish flush with the top of the concrete surface.

3.4 DOOR FRAMES

Door frames shall be secured to the floor slab by means of angle clips and expansion bolts. Continuous door stops shall be welded to the frame or tap screwed with countersunk screws at no more than 450 mm centers, assuring in either case full contact with the frame. Any necessary reinforcements shall be made and the frames shall be drilled and tapped as required for hardware.

3.5 TRENCH FRAMES AND COVERS

Trench frames and covers shall finish flush with the floor.

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DIVISION 07 - THERMAL & MOISTURE PROTECTION

SECTION 07111

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SECTION 07111

ELASTOMERIC MEMBRANE WATERPROOFING

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 297	(1993) Rubber Products - Chemical Analysis
ASTM D 412	(1992) Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers - Tension
ASTM D 471	(1995) Rubber Property - Effect of Liquids
ASTM D 624	(1991) Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers
ASTM D 1004	(1994a) Initial Tear Resistance of Plastic Film and Sheeting
ASTM D 4637	(1987) Vulcanized Rubber Sheet Used in Single-Ply Roof Membrane
ASTM E 96	(1994) Water Vapor Transmission of Materials
ASTM E 154	(1988; R 1993) Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover
ASTM G 21	(1990) Determining Resistance of Synthetic Polymeric Materials to Fungi

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL PROCEDURES:

SD-04 Drawings

Waterproofing System; FIO.

Detail drawings showing size of sheets, position of sheets and splices, flashing and termination details, and expansion joint details.

SD-06 Instructions

Installation; FIO.

Manufacturer's instructions for installation of the elastomeric membrane, including procedures for preparing the membrane for use, flashing, and splicing. Instructions shall include recommended or required protective covering and procedures for safe handling and use of cleaners, adhesives, and sealants.

SD-13 Certificates

Materials; FIO.

Certificates of compliance attesting that the materials meet specification requirements. Certificates may show qualification of the identical compound in the specified test.

1.3 DELIVERY, STORAGE, AND HANDLING

Materials shall be delivered to the job site in unopened containers bearing the manufacturer's name, brand name, and description of contents. Membrane, flashing, and adhesives shall be stored in clean, dry areas. Storage temperature for adhesives shall be between 16 and 27 degrees C. Protection board shall be stored flat and off the ground.

PART 2 PRODUCTS

2.1 MATERIALS

Adhesives, mastics, cements, tapes, and primers shall be as recommended by the membrane manufacturer and shall be compatible with the material to which they are to be bonded.

2.1.1 Performance Requirements

All membranes shall meet the following requirements when tested by the referenced ASTM standards:

Puncture Resistance (ASTM E 154)	178 N (40 pounds), (min.)
Water Vapor Transmission at 27 degrees C Permeance (ASTM E 96, Procedure B)	14.4 ng per Pa per second per square meter (0.25 perms) (max.)
Resistance to Soil Bacteria or Fungi ASTM G 21 or ASTM E 154)	No sustained growth or discoloration after 21 days

2.1.1.1 Butyl Rubber

Thickness, plus or minus 10 percent	1.52 mm
Specific Gravity (ASTM D 297)	1.2 plus or minus 0.05
Tensile Strength (ASTM D 412)	8275 kPa (1200 psi)

	(min.)
Elongation (ASTM D 624)	300 percent (min.)
Tear Resistance (ASTM D 624)	21 900 Newtons per m (125 lb./inch) (min.)
Water Absorption (ASTM D 471) 70 degrees C (158 degrees F)	plus 2 percent (max.)

2.1.1.2 Plastic Elastomeric Sheetting

Membrane shall be a minimum of 1.42 mm thick and shall meet the following requirements:

Textile Strength (ASTM D 412, Die C)	1520 kPa (220 psi) (min.)
Elongation (ASTM D 412, Die C)	250 percent (min.)
Tear Resistance (ASTM D 1004)	61 300 Newtons per m (350 lb./inch) (min.)

2.1.1.3 Composite Self-Adhering Membrane

Membrane shall be a polymeric sheeting integrally bonded to rubberized asphalt with a minimum thickness of 1.52 mm.

2.1.2 Protection Board

Protection board for waterproofing membrane shall be 25 mm thick polystyrene foam insulation.

2.2 ACCESSORIES

Flashing, counterflashing, expansion joint covers and corner fillets shall be as recommended by the membrane manufacturer.

PART 3 EXECUTION

3.1 PREPARATION

Surfaces to which waterproofing is to be applied shall be clean, smooth, and free from deleterious materials and projections. Holes, honeycomb, cracks, or cavities shall be pointed or filled and finished flush with portland cement mortar. Top surfaces of projecting masonry or concrete ledges below grade, except footings, shall be beveled. Before waterproofing is applied, the surfaces to be covered shall be swept to remove all dust and foreign matter. Concrete surfaces to receive elastomeric waterproofing shall not be cured with compounds containing wax or oil. Masonry surfaces to be waterproofed shall have joints struck flush.

3.2 APPLICATION

Waterproofing shall not be applied to wet surfaces. The ambient and surface temperatures shall be above 4.5 degrees C during application. Membrane under slabs shall be carried up abutting vertical surfaces to the

level of finish of floor or to within 13 mm of the top edge of base where base is shown and cemented solid to the substrate. Membrane shall not be continuous through walls, floors, piers, and columns unless otherwise shown. Concrete surfaces shall be primed to receive the membrane. Membranes shall be handled and installed in accordance with the approved installation instructions. Primers, adhesives, and mastics shall be applied in accordance with the membrane manufacturer's printed instructions. Laps shall be oriented so that water will flow over the lap, and not into them. As soon as the mastic is fully set and dry, joints shall be checked. Where any openings or fishmouths appear, joints shall be resealed and rerolled. Wrinkles and buckles shall be avoided in applying membrane and joint reinforcement. Nonadhering membranes shall be unrolled and allowed to remain flat for at least 2 hours before application. Membranes shall be drawn tight during installation without stretching. Self-adhering membrane shall be installed by removing the release sheets on the back of the membrane and applying the tacky surface onto the primed surface. Laps and splices shall be sealed prior to completion of a day's work.

3.2.1 Butyl Rubber

Each sheet shall be lapped at sides and ends a minimum of 150 mm over the preceding sheet. Lap and splice areas of membrane shall be cleaned with heptane, hexane, or white gasoline. Unvulcanized compounded butyl tape, 150 mm wide shall be applied between lapped splices so that the tape extends approximately 6 mm beyond the exposed sheeting edge. The tape shall be rolled firmly into place as it is applied. Tape backing shall be removed and the lapped sheeting rolled or pressed into place. Splicing adhesive shall be applied to the lapped area 90 mm on either side of the lapped edge. The splice adhesive shall be allowed to dry thoroughly and the lap reinforced with 150 mm wide unvulcanized compounded butyl tape. Full contact shall be made for all lap areas. Corner splices and flashing overlaps shall be reinforced with a 300 mm wide strip of membrane over one layer of butyl tape or with a prefabricated corner of butyl rubber.

3.2.2 Plastic Elastomeric Sheeting

Sheeting shall be applied in sections no longer than 5400 mm. Each sheeting shall be lapped at sides and ends a minimum of 150 mm over the preceding sheet. Lap splices shall be reinforced with 300 mm wide strips of plastic sheeting or as recommended in the approved installation instructions. Lap and splices shall be sealed in a full bed of adhesive at the rate recommended by the manufacturer of the material. Sheeting and joint strips shall be rolled with 23 to 45 kg roller on horizontal and [152.4 mm (6 inch) rubber hand roller on vertical surfaces.

3.2.3 Composite Self-Adhering Membrane

On vertical surfaces, membrane shall be applied in lengths up to 2400 mm starting at the bottom. Each sheet shall be lapped at edges and ends a minimum of 65 mm over the preceding sheets. The membrane shall be rolled to adhere with the substrate. Corners and joints shall be double-covered by first applying a 300 mm width of membrane centered along the corner or joint. Inside and outside corners shall then be covered with membrane. Exposed termination edges of membrane on horizontal or vertical surfaces shall be finished with a troweled bead of mastic. Mastic shall be applied around termination edges of membrane and around drains and projections. Mastic shall be applied at the termination of each day's work.

3.3 TESTS

When required, and after the system is cured, the membranes on horizontal surfaces shall be tested by flooding the entire waterproofed area with a minimum of 50 mm head of water for a period of 24 hours. There shall be no water added after the start of the period. Water level shall be measured at the beginning and at the end of the 24 hour period. If the water level falls, remove the water and inspect the waterproofing membrane. Leak sites shall be marked, dried and repaired, and the test shall be repeated.

3.4 PROTECTION

Horizontal applications of membrane shall be protected from traffic during installation. No equipment shall be allowed directly on the membrane. Plywood, or similar material, overlayment shall be provided for wheel-ways.

Walkways shall be provided where heavy traffic from other trades is expected. Materials shall not be stored on the membrane. A protective covering shall be installed over the membrane immediately after installation or testing. If membrane is to be exposed, a temporary covering shall be applied to protect the membrane until the protection board is installed.

3.4.1 Projections

Projections passing through membrane shall be flashed as recommended by the manufacturer of the waterproofing membrane.

3.4.2 Counterflashing

Waterproofing connecting with work exposed to the weather shall be counterflashed to form a watertight connection. Upper edge of membrane waterproofing and protective covering shall be counterflashed.

3.4.3 Expansion Joints and Fillets

Expansion joints and corner fillets shall be installed as recommended by the manufacturer of the waterproofing membrane.

3.4.4 Vertical Membrane Waterproofing

Waterproofing shall be protected with a 13 mm minimum fiberboard, 13 mm asphalt-impregnated fiberboard or 3 mm compatible water-resistant (bitumen type) protection board. Edges of protection shall be butted, and exposed surfaces shall be covered by a coating of bitumen.

3.4.5 Horizontal Membrane Waterproofing

Waterproofing shall be covered with portland cement mortar not less than 19 mm thick, uniformly placed and allowed to set before subsequent construction is installed.

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SECTION 07270

FIRESTOPPING

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM E 84 (1995a) Surface Burning Characteristics of Building Materials

ASTM E 814 (1994b) Fire Tests of Through-Penetration Fire Stops

UNDERWRITERS LABORATORIES (UL)

UL-05 (1995; Supple) Fire Resistance Directory

UL 723 (1993; Rev Apr 1994) Test for Surface Burning Characteristics of Building Materials

UL 1479 (1994) Fire Tests of Through-Penetration Firestops

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL PROCEDURES:

SD-04 Drawings

Firestopping Materials; FIO.

Detail drawings including manufacturer's descriptive data, typical details, installation instructions and the fire-test data and/or report as appropriate for the fire resistance rated construction and location. Submittal shall indicate the firestopping material to be provided for each type of application. When more than 5 penetrations are to receive firestopping, drawings shall indicate location and type of application.

SD-13 Certificates

Firestopping Materials; FIO.

Certificates attesting that firestopping material complies with the specified requirements. The label or listing of the Underwriters Laboratories will be acceptable evidence. In lieu of the label or listing,

a written certificate may be submitted from an approved, nationally recognized testing agency equipped to perform such services, stating that the items have been tested and conform to the specified requirements and testing methods.

Installer Qualifications; FIO.

Certification stating that installer is qualified and trained to install the specified firestopping material.

Inspection; FIO.

Manufacturer's representative certification stating that firestopping work has been inspected and found to be applied according to the manufacturer's recommendations and the specified requirements.

1.3 GENERAL REQUIREMENTS

Firestopping shall consist of furnishing and installing a material or a combination of materials to form an effective barrier against the spread of flame, smoke and gases, and maintain the integrity of fire resistance rated walls, partitions, floors, and ceiling-floor assemblies, including through-penetrations and construction joints. Through-penetrations include the annular space around pipes, tubes, conduit, wires, cables and vents. Construction joints include those used to accommodate expansion, contraction, wind, or seismic movement; firestopping material shall not interfere with the required movement of the joint.

1.4 STORAGE AND DELIVERY

Materials shall be delivered in the original unopened packages or containers showing name of the manufacturer and the brand name. Materials shall be stored off the ground and shall be protected from damage and exposure to elements. Damaged or deteriorated materials shall be removed from the site.

1.5 INSTALLER QUALIFICATIONS

Installer of firestopping material shall be trained by the manufacturer or the manufacturer's representative, and shall have a minimum of 3 years experience in the installation of firestopping of the type specified.

PART 2 PRODUCTS

2.1 FIRESTOPPING MATERIALS

Firestopping materials shall consist of commercially manufactured products complying with the following minimum requirements:

2.1.1 Fire Hazard Classification

Material shall have a flame spread of 25 or less, and a smoke developed rating of 50 or less, when tested in accordance with ASTM E 84 or UL 723. Material shall be an approved firestopping material as listed in UL-05.

2.1.2 Toxicity

Material shall be nontoxic to humans at all stages of application.

2.1.3 Fire Resistance Rating

Firestopping will not be required to have a greater fire resistance rating than that of the assembly in which it is being placed.

2.1.3.1 Through-Penetrations

Firestopping materials for through-penetrations, as described in paragraph GENERAL REQUIREMENTS, shall provide "F" and "T" fire resistance ratings in accordance with ASTM E 814 or UL 1479, except that T Ratings are not required for penetrations smaller than or equal to a 100 mm nominal pipe or 0.01 square meter in overall cross sectional area. Fire resistance ratings shall be the following:

- a. Penetrations of Fire Resistance Rated Walls and Partitions: F Rating = 3 hour, T Rating = 3 hour.
- b. Penetrations of Fire Resistance Rated Floors and Ceiling-Floor Assemblies; F Rating = 3 hour, T Rating = 3 hour.

2.1.3.2 Construction Joints and Gaps

Fire resistance ratings of construction joints, as described in paragraph GENERAL REQUIREMENTS, and gaps such as those between floor slabs or roof decks and curtain walls shall be the same as the construction in which they occur.

PART 3 EXECUTION

3.1 PREPARATION

Areas to receive firestopping shall be free of dirt, grease, oil, or loose materials which may affect the fitting or fire resistance of the firestopping system.

3.2 INSTALLATION

Firestopping material shall completely fill void spaces regardless of geometric configuration, subject to tolerance established by the manufacturer. Firestopping for filling floor voids 100 mm or more in any direction shall be capable of supporting the same load as the floor is designed to support or shall be protected by a permanent barrier to prevent loading or traffic in the firestopped area. Firestopping shall be installed in accordance with manufacturer's written instructions. Firestopping shall be provided in the following locations, except in floor slabs on grade:

- a. Penetrations of duct, conduit, tubing, cable and pipe through floors and through fire-resistance rated walls, partitions, and ceiling-floor assemblies.
- b. Penetrations of vertical shafts such as pipe chases, and utility chutes.
- c. Gaps at the intersection of floor slabs and curtain walls, including inside of hollow curtain walls at the floor slab.
- d. Gaps at perimeter of fire-resistance rated walls and partitions,

such as between the top of the walls and the bottom of roof decks.

- e. Construction joints in floors and fire rated walls and partitions.
- f. Other locations where required to maintain fire resistance rating of the construction.

3.3 INSPECTION

Firestopped areas shall not be covered or enclosed until inspection is complete and approved. A manufacturer's representative shall inspect the applications initially to ensure adequate preparations (clean surfaces suitable for application, etc.) and periodically during the work to assure that the completed work has been accomplished according to the manufacturer's written instructions and the specified requirements.

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SECTION 07413

METAL ROOFING AND SIDING

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ALUMINUM ASSOCIATION (AA)

- | | |
|-----------|-----------------------------------------------------------------------------------------------------|
| AA-01 | (1993) Aluminum Standards and Data |
| AA SAS-30 | (1986) Aluminum Construction Manual Series
- Section 1 Specifications for Aluminum
Structures |

AMERICAN IRON AND STEEL INSTITUTE (AISI)

- | | |
|-------------|----------------------------------------|
| AISI SG-673 | (1987) Cold-Formed Steel Design Manual |
|-------------|----------------------------------------|

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- | | |
|-------------|--------------------------------------------------------------------------------------------------------------------------------|
| ASTM A 446 | (1993) Steel Sheet, Zinc-Coated
(Galvanized) by the Hot-Dip Process,
Structural (Physical) Quality |
| ASTM A 463 | (1994) Steel Sheet, Aluminum-Coated, by
the Hot-Dip Process |
| ASTM A 792 | (1993a) Steel Sheet, 55% Aluminum-Zinc
Alloy-Coated by the Hot-Dip Process,
General Requirements |
| ASTM B 117 | (1994) Operating Salt Spray (Fog) Testing
Apparatus |
| ASTM B 209 | (1993) Aluminum and Aluminum-Alloy Sheet
and Plate |
| ASTM C 518 | (1991) Steady-State Heat Flux Measurements
and Thermal Transmission Properties by
Means of the Heat Flow Meter Apparatus |
| ASTM C 553 | (1992) Mineral Fiber Blanket Thermal
Insulation for Commercial and Industrial
Applications |
| ASTM C 612 | (1993) Mineral Fiber Block and Board
Thermal Insulation |
| ASTM C 1289 | (1995) Faced Rigid Cellular
Polyisocyanurate Thermal Insulation Board |

ASTM D 522	(1993a) Mandrel Bend Test of Attached Organic Coatings
ASTM D 523	(1989; R 1993) Specular Gloss
ASTM D 714	(1987; R 1994) Evaluating Degree of Blistering of Paints
ASTM D 968	(1993) Abrasion Resistance of Organic Coatings by Falling Abrasive
ASTM D 1308	(1987; R 1993) Effect of Household Chemicals on Clear and Pigmented Organic Finishes
ASTM D 1654	(1992) Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments
ASTM D 2244	(1993) Calculation of Color Differences from Instrumentally Measured Color Coordinates
ASTM D 2247	(1994) Testing Water Resistance of Coatings in 100% Relative Humidity
ASTM D 2794	(1993) Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)
ASTM D 3359	(1995) Measuring Adhesion by Tape Test
ASTM D 4214	(1989) Evaluating the Degree of Chalking of Exterior Paint Films
ASTM D 4397	(1991) Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications
ASTM E 84	(1994a) Surface Burning Characteristics of Building Materials
ASTM E 96	(1994) Water Vapor Transmission of Materials
ASTM E 1042	(1992) Acoustically Absorptive Materials Applied by Trowel or Spray
ASTM G 23	(1995) Operating Light-Exposure Apparatus (Carbon-Arc Type) With and Without Water for Exposure of Nonmetallic Materials

UNDERWRITERS LABORATORIES (UL)

UL 580	(1994; Rev thru Apr 1995) Tests for Uplift Resistance of Roof Assemblies
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1.2 DESIGN REQUIREMENTS

Contract drawings indicate the design loads and the extent and general assembly details of the metal roofing and siding. Members and connections not indicated on the drawings shall be designed by the Contractor. Roofing and siding panels, components, transitions, and assemblies shall be the products of the same manufacturer. Roofing and siding will be designed to provide the minimum section properties shown with an allowable deflection under design load of $L/180$. Steel covering design, including section modulus and moment of inertia determinations, will be in accordance with AISI SG-673. Aluminum covering will be designed in accordance with AA-01. Section modulus and moment of inertia of aluminum sheet will be determined for actual cross section dimensions by the conventional methods for actual design stresses and by effective width concept for deflection in accordance with AA SAS-30.

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL PROCEDURES:

SD-04 Drawings

Metal Roofing and Siding; FIO.

Drawings consisting of catalog cuts, design and erection drawings, shop coating and finishing specifications, and other data as necessary to clearly describe design, materials, sizes, layouts, construction details, fasteners, and erection. Drawings shall be accompanied by engineering design calculations for the structural properties of roofing and siding units.

SD-13 Certificates

Roof and Wall Panels; FIO. Installation; FIO. Accessories; FIO.

Certificates attesting that the panels and accessories conform to the requirements specified. Certificate for the roof assembly shall certify that the assembly complies with the material and fabrication requirements specified and is suitable for the installation at the indicated design slope. Certified laboratory test reports showing that the sheets to be furnished are produced under a continuing quality control program and that a representative sample consisting of not less than 5 pieces has been tested and has met the quality standards specified for factory color finish.

Mill certification for structural bolts, wall and roof covering, and wall liner panels.

SD-14 Samples

Accessories; FIO.

One sample of each type of flashing, trim, closure, cap and similar items. Size shall be sufficient to show construction and configuration.

Roof and Wall Panels; FIO.

One piece of each type and finish (exterior and interior) to be used, 225 mm

long, full width.

Fasteners; FIO.

Two samples of each type to be used with statement regarding intended use. If so requested, random samples of bolts, nuts, and washers as delivered to the jobsite shall be taken in the presence of the Contracting Officer and provided to the Contracting Officer for testing to establish compliance with specified requirements.

Sealant; FIO.

One sample, approximately 0.5 kg, and descriptive data.

1.4 DELIVERY AND STORAGE

Materials shall be delivered to the site in a dry and undamaged condition and stored out of contact with the ground. Materials shall be covered with weathertight coverings and kept dry. Storage accommodations for roof and wall covering shall provide good air circulation and protection from surface staining.

PART 2 PRODUCTS

2.1 ROOF AND WALL COVERING

Panels shall be either steel or aluminum and shall have a factory color finish. Length of sheets shall be sufficient to cover the entire length of any unbroken roof slope or the entire height of any unbroken wall surface when length of run is 9 m or less. When length of run exceeds 9 m, each sheet in the run shall extend over two or more spans. Sheets longer than 9 m may be furnished if approved by the Contracting Officer. Width of sheets with overlapping configurations shall provide not less than 600 mm of coverage in place, and those with interlocking ribs shall provide not less than 300 mm of coverage in place. Design provisions shall be made for thermal expansion and contraction consistent with the type of system to be used. All sheets shall be either square-cut or miter-cut except that gable end wall sheets may be cut in the shop to correspond to the roof slope and may have a horizontal joint at the eave line.

2.1.1 Roof Panels

Roof panels shall have configurations for overlapping sheets. Roof deck assemblies shall be Class 90 as defined in UL 580. System for securing the roof covering to structural framing members shall be exposed, penetrating fastener type. The ridge cap shall not have exposed fasteners. Height of corrugation at overlap of adjacent roof sheets shall be the building manufacturer's standard for the indicated roof slope.

2.1.2 Wall Panels

Wall panels shall have configurations for overlapping adjacent sheets. Wall covering shall be fastened to framework using exposed fasteners.

2.1.3 Steel Panels

Zinc-coated steel conforming to ASTM A 446, G 90 coating designation; aluminum-zinc alloy coated steel conforming to ASTM A 792, AZ 55 coating; or aluminum-coated steel conforming to ASTM A 463, Type 2, coating

designation T2 65. Roof and wall panels shall be 0.6 mm thick minimum. Prior to shipment, mill finish panels shall be treated with a passivating chemical and oiled to inhibit the formation of oxide corrosion products. Panels that have become wet during shipment but have not started to oxidize shall be dried, retreated, and re-oiled.

2.1.4 Aluminum Panels

Alloy conforming to ASTM B 209, temper as required for the forming operation, minimum 0.8 mm thick.

2.2 FACTORY COLOR FINISH

Wall and roof panels shall have a factory applied polyvinylidene fluoride finish on the exposed side. The exterior finish shall consist of a baked-on fluoropolymer enamel topcoat with an appropriate prime coat. Color shall match the color indicated on the drawings. The exterior coating shall be a nominal 0.025 mm thickness consisting of a polyvinylidene fluoride topcoat of not less than 0.018 mm dry film thickness and the paint manufacturer's recommended primer of not less than 0.005 mm thickness. The interior color finish shall consist of the same coating and dry film thickness as the exterior. The exterior color finish shall meet the test requirements specified below.

2.2.1 Salt Spray Test

A sample of the sheets shall withstand a salt spray test for a minimum of 1000 hours in accordance with ASTM B 117, including the scribe requirement in the test. Immediately upon removal of the panel from the test, the coating shall receive a rating of 10, no blistering, as determined by ASTM D 714; and a rating of 6, 3 mm failure at scribe, as determined by ASTM D 1654.

2.2.2 Formability Test

When subjected to testing in accordance with ASTM D 522, the coating film shall show no evidence of fracturing to the naked eye.

2.2.3 Accelerated Weathering, Chalking Resistance and Color Change

A sample of the sheets shall be tested for a minimum of 1000 hours in accordance with ASTM G 23, Method 2, using a Type EH apparatus with cycles of 60 minutes radiation and 60 minutes condensing humidity. The coating shall withstand the weathering test without cracking, peeling, blistering, loss of adhesion of the protective coating, or corrosion of the base metal.

Protective coating that can be readily removed from the base metal with tape in accordance with ASTM D 3359, Test Method B, shall be considered as an area indicating loss of adhesion. Following the accelerated weathering test, the coating shall have a chalk rating not less than No. 8 in accordance with ASTM D 4214 test procedures, and the color change shall not exceed 5 CIE or Hunter Lab color difference (ΔE) units in accordance with ASTM D 2244. For sheets required to have a low gloss finish, the chalk rating shall be not less than No. 6 and the color difference shall be not greater than 7 units.

2.2.4 Humidity Test

When subjected to a humidity cabinet test in accordance with ASTM D 2247 for 1000 hours, a scored panel shall show no signs of blistering, cracking,

creepage or corrosion.

2.2.5 Impact Resistance

Factory-painted sheet shall withstand direct and reverse impact in accordance with ASTM D 2794 equal to 1.5 times metal thickness in millimeters expressed in newton-meters , with no loss of adhesion.

2.2.6 Abrasion Resistance Test

When subjected to the falling sand test in accordance with ASTM D 968 the coating system shall withstand a minimum of [50] [80] liters of sand before the appearance of the base metal. The term "appearance of base metal" refers to the metallic coating on steel or the aluminum base metal.

2.2.7 Specular Gloss

Finished roof surfaces shall have a specular gloss value of 10 or less at an angle of 85 degrees when measured in accordance with ASTM D 523.

2.2.8 Pollution Resistance

Coating shall show no visual effects when immersion tested in a 10 percent hydrochloric acid solution for 24 hours in accordance with ASTM D 1308.

2.3 ACCESSORIES

Accessories shall be compatible with the covering furnished. Flashing, trim, metal closure strips, caps, and similar metal accessories shall be not less than the minimum thicknesses specified for covering. Exposed metal accessories shall be finished to match the panels furnished. Molded closure strips shall be bituminous-saturated fiber, closed-cell or solid-cell synthetic rubber or neoprene, or polyvinyl chloride premolded to match configuration of the covering and shall not absorb or retain water.

2.4 FASTENERS

Fasteners for steel wall and roof panels shall be zinc-coated steel, aluminum, corrosion resisting steel, or nylon capped steel, type and size specified below or as otherwise approved for the applicable requirements. Fasteners for aluminum wall and roof panels shall be aluminum or corrosion resisting steel. Fasteners for structural connections shall provide both tensile and shear strength of not less than 3.336 kN (750 lbs). Fasteners for accessories shall be the manufacturer's standard. Exposed roof fasteners shall be gasketed or have gasketed washers on the exterior side of the covering to waterproof the fastener penetration. Washer material shall be compatible with the covering; have a minimum diameter of 9 mm for structural connections; and gasketed portion of fasteners or washers shall be neoprene or other equally durable elastomeric material approximately 3 mm thick. When wall covering is factory color finished, exposed wall fasteners shall be color finished or provided with plastic color caps to match the covering. Nonpenetrating fastener system for wall panels using concealed clips shall be manufacturer's standard for the system provided.

2.4.1 Screws

Screws shall be as recommended by the manufacturer to meet the strength design requirements of the panels.

2.4.2 End-Welded Studs

Automatic end-welded studs shall be shouldered type with a shank diameter of not less than 5 mm and cap or nut for holding covering against the shoulder.

2.4.3 Explosive Actuated Fasteners

Fasteners for use with explosive actuated tools shall have a shank of not less than 3.68 mm with a shank length of not less than 13 mm for fastening panels to steel and not less than 25 mm for fastening panels to concrete.

2.4.4 Blind Rivets

Blind rivets shall be aluminum with 5 mm nominal diameter shank or stainless steel with 3 mm nominal diameter shank. Rivets shall be threaded stem type if used for other than the fastening of trim. Rivets with hollow stems shall have closed ends.

2.4.5 Bolts

Bolts shall be not less than 6 mm diameter, shouldered or plain shank as required, with proper nuts.

2.5 SEALANT

Sealant shall be an elastomeric type containing no oil or asphalt. Exposed sealant shall be [colored to match the applicable building color] [clear] and shall cure to a rubberlike consistency. Concealed sealant may be the nonhardening type.

2.6 GASKETS AND INSULATING COMPOUNDS

Gaskets and insulating compounds shall be nonabsorptive and suitable for insulating contact points of incompatible materials. Insulating compounds shall be nonrunning after drying.

PART 3 EXECUTION

3.1 INSTALLATION

Installation shall be as specified and in accordance with the approved erection instructions and drawings to produce a weather tight structure. Dissimilar materials which are not compatible when contacting each other shall be insulated from each other by means of gaskets or insulating compounds. Improper or mislocated drill holes shall be plugged with an oversize screw fastener and gasketed washer; however, sheets with an excess of such holes or with such holes in critical locations shall not be used. Exposed surfaces and edges shall be kept clean and free from sealant, metal cuttings, hazardous burrs, and other foreign material. Stained, discolored, or damaged sheets shall be removed from the site.

3.1.1 Wall Covering and Roof Covering

Wall covering shall be applied with the longitudinal configurations in the vertical position. Roof covering shall be applied with the longitudinal configurations in the direction of the roof slope. Accessories shall be fastened into framing members, except as otherwise approved. Closure strips shall be provided as indicated and where necessary to provide

weathertight construction.

3.1.1.1 Lap Type Panels with Exposed Fasteners

End laps shall be made over framing members with fasteners into framing members approximately 50 mm from the end of the overlapping sheet. Side laps shall be laid away from the prevailing winds. Side and end lap distances, joint sealing, and fastening and spacing of fasteners shall be in accordance with manufacturer's standard practice insofar as the maximum spacings specified are not exceeded and provided such standard practice will result in a structure which will be free from water leaks and meet design requirements. Spacing of fasteners shall present an orderly appearance and shall not exceed: 200 mm on center at end laps of covering, 200 mm on center at connection of covering to intermediate supports, 300 mm on center at side laps of roof coverings, and 450 mm on center at side laps of wall coverings except when otherwise approved. Side laps and end laps of roof and wall covering and joints at accessories shall be sealed. Fasteners shall be installed in straight lines within a tolerance on 13 mm in the length of a bay. Fasteners shall be driven normal to the surface and to a uniform depth to seat the gasketed washers properly.

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SECTION 07600

SHEET METALWORK, GENERAL

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 167	(1993) Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
ASTM B 32	(1993) Solder Metal
ASTM B 209	(1993) Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B 221	(1993) Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
ASTM B 370	(1992) Copper Sheet and Strip for Building Construction
ASTM D 226	(1994) Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing
ASTM D 543	(1987) Resistance of Plastics to Chemical Reagents
ASTM D 822	(1989) Conducting Tests on Paint and Related Coatings and Materials Using Filtered Open-Flame Carbon-Arc Light and Water Exposure Apparatus
ASTM D 828	(1993) Tensile Breaking Strength of Paper and Paperboard
ASTM D 1784	(1992) Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
ASTM D 2822	(1991) Asphalt Roof Cement
ASTM D 3656	(1989) Insect Screening and Louver Cloth Woven from Vinyl-Coated Glass Yarns
ASTM D 4022	(1994) Coal Roof Cement, Asbestos Containing
ASTM D 4586	(1993) Asphalt Roof Cement, Asbestos Free

ASTM E 96 (1994) Water Vapor Transmission of Materials

INSECT SCREENING WEAVERS ASSOCIATION (ISWA)

ISWA IWS 089 (1990) Recommended Standards and Specifications for Insect Wire Screening

SHEET METAL AND AIR CONDITIONING CONTRACTORS NATIONAL ASSOCIATION (SMACNA)

SMACNA-02 (1993) Architectural Sheet Metal Manual

1.2 GENERAL REQUIREMENTS

Sheet metalwork shall be accomplished to form weathertight construction without waves, warps, buckles, fastening stresses or distortion, and shall allow for expansion and contraction.

1.2.1 Coordination

Cutting, fitting, drilling, and other operations in connection with sheet metal required to accommodate the work of other trades shall be performed by sheet metal mechanics. Installation of sheet metal items used in conjunction with roofing shall be coordinated with roofing work to permit continuous roofing operations. Sheet metalwork pertaining to heating, ventilating, and air conditioning is specified in Section 15895.

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL PROCEDURES:

SD-04 Drawings

Materials; FIO.

Drawings of sheet metal items showing weights, gauges or thicknesses; types of materials; expansion-joint spacing; fabrication details; and installation procedures.

1.4 DELIVERY, STORAGE, AND HANDLING

Materials shall be adequately packaged and protected during shipment and shall be inspected for damage, dampness, and wet-storage stains upon delivery to the jobsite. Materials shall be clearly labeled as to type and manufacturer. Sheet metal items shall be carefully handled to avoid damage. Materials shall be stored in dry, ventilated areas until immediately before installation.

PART 2 PRODUCTS

2.1 MATERIALS

Lead, lead-coated metal, and galvanized steel shall not be used. Any metal

listed by SMACNA-02 for a particular item may be used, unless otherwise specified or indicated. Materials shall conform to the requirements specified below and to the thicknesses and configurations established in SMACNA-02. Different items need not be of the same metal, except that if copper is selected for any exposed item, all exposed items shall be copper.

2.1.1 Accessories

Accessories and other items essential to complete the sheet metal installation, though not specifically indicated or specified, shall be provided.

2.1.2 Aluminum Extrusions

ASTM B 221, Alloy 6063, Temper T5.

2.1.3 Bituminous Cement

Type I asphalt cement conforming to ASTM D 2822 or ASTM D 4586. For coal tar roofing; coal tar cement conforming to ASTM D 4022.

2.1.4 Sealant

Unless otherwise specified, sealant shall be an elastomeric weather resistant sealant as specified in Section 07920 JOINT SEALING.

2.1.5 Fasteners

Fasteners shall be compatible with the fastened material and shall be the type best suited for the application.

2.1.6 Felt

ASTM D 226, Type I.

2.1.7 Polyvinyl Chloride (PVC) Reglets

ASTM D 1784, Class 14333D, 1.9 mm minimum thickness.

2.1.8 Aluminum Alloy Sheet and Plate

ASTM B 209, form, alloy, and temper appropriate for use.

2.1.9 Copper

ASTM B 370, Temper H 00.

2.1.10 Stainless Steel

ASTM A 167, Type 302 or 304; fully annealed, dead soft temper.

2.1.11 Solder

ASTM B 32, 95-5 tin-antimony.

PART 3 EXECUTION

3.1 PROTECTION OF ALUMINUM

Aluminum shall not be used where it will be in contact with copper or where it will contact water which flows over copper surfaces. Aluminum that will be in contact with wet or pressure-treated wood, mortar, concrete, masonry, or ferrous metals shall be protected against galvanic or corrosive action by one of the following methods:

3.1.1 Paint

Aluminum surfaces shall be solvent cleaned and given one coat of zinc-molybdate primer and one coat of aluminum paint as specified in Section 09900 PAINTING, GENERAL.

3.1.2 Nonabsorptive Tape or Gasket

Nonabsorptive tape or gasket shall be placed between the adjoining surfaces and cemented to the aluminum surface using a cement compatible with aluminum.

3.2 CONNECTIONS AND JOINTING

3.2.1 Soldering

Soldering shall apply to copper, and stainless steel items. Edges of sheet metal shall be pretinned before soldering is begun. Soldering shall be done slowly with well heated soldering irons so as to thoroughly heat the seams and completely sweat the solder through the full width of the seam. Edges of stainless steel to be pretinned shall be treated with soldering acid flux. Soldering shall follow immediately after application of the flux. Upon completion of soldering, the acid flux residue shall be thoroughly cleaned from the sheet metal with a water solution of washing soda and rinsed with clean water.

3.2.2 Riveting

Joints in aluminum sheets 1.0 mm or less in thickness shall be mechanically made.

3.2.3 Seaming

Flat-lock and soldered-lap seams shall finish not less than 25 mm wide. Unsoldered plain-lap seams shall lap not less than 75 mm unless otherwise specified. Flat seams shall be made in the direction of the flow.

3.3 CLEATS

A continuous cleat shall be provided where indicated or specified to secure loose edges of the sheet metalwork. Butt joints of cleats shall be spaced approximately 3 mm apart. The cleat shall be fastened to supporting wood construction with nails evenly spaced not over 300 mm on centers. Where the fastening is to be made to concrete or masonry, screws shall be used and shall be driven in expansion shields set in concrete or masonry.

3.4 FLASHINGS

Flashings shall be installed at locations indicated and as specified below.

Sealing shall be according to the flashing manufacturer's recommendations.

Flashings shall be installed at intersections of roof with vertical surfaces and at projections through roof, except that flashing for heating and plumbing, including piping, roof, and floor drains, and for electrical

conduit projections through roof or walls are specified in other sections. Except as otherwise indicated, counter flashings shall be provided over base flashings. Perforations in flashings made by masonry anchors shall be covered up by an application of bituminous plastic cement at the perforation. Flashing shall be installed on top of joint reinforcement. Flashing shall be formed to direct water to the outside of the system.

3.4.1 Base Flashing

Metal base flashing shall be coordinated with roofing work. Metal base flashing shall be set in plastic bituminous cement over the roofing membrane, nailed to nailing strip, and secured in place on the roof side with nails spaced not more than 75 mm on centers. Metal base flashing shall not be used on built-up roofing.

3.4.2 Counter Flashings

Except as otherwise indicated, counter flashings shall be provided over base flashings. Counter flashing shall be installed as shown on the drawings. Where bituminous base flashings are provided, the counter flashing shall extend down as close as practicable to the top of the cant strip. Counter flashing shall be factory formed to provide spring action against the base flashing.

3.5 REGLETS

Reglets shall be a factory fabricated product of proven design, complete with fittings and special shapes as required. Open-type reglets shall be filled with fiberboard or other suitable separator to prevent crushing of the slot during installation. Reglet plugs shall be spaced not over 300 mm on centers and reglet grooves shall be filled with sealant. Friction or slot-type reglets shall have metal flashings inserted the full depth of slot and shall be lightly punched every 300 mm to crimp the reglet and counter flashing together. Polyvinyl chloride reglets shall be sealed with the manufacturer's recommended sealant.

3.6 CONTRACTOR QUALITY CONTROL

The Contractor shall establish and maintain a quality control procedure for sheet metal used in conjunction with roofing to assure compliance of the installed sheet metalwork with the contract requirements. Any work found not to be in compliance with the contract shall be promptly removed and replaced or corrected in an approved manner. Quality control shall include, but not be limited to, the following:

- a. Observation of environmental conditions; number and skill level of sheet metal workers; condition of substrate.
- b. Verification of compliance of materials before, during, and after installation.
- c. Inspection of sheet metalwork for proper size and thickness, fastening and joining, and proper installation.

The actual quality control observations and inspections shall be documented and a copy of the documentation furnished to the Contracting Officer at the end of each day.

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SECTION 07720

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SECTION 07720

ROOF VENTILATORS, GRAVITY-TYPE

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 526	(1990) Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Commercial Quality
ASTM B 209	(1995) Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B 221	(1995a) Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes and Tubes

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

ASCE 7	(1993) Minimum Design Loads for Buildings & Other Structures
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1.2 DESIGN REQUIREMENTS

Ventilators shall be designed for use with the specific type of project roofing system, and shall provide uniform and continuous air flow. Ventilator design shall provide protection against rain and snow, and shall be provided with a continuous weep along the bottom of both sides of wind band. Units shall be self-cleaning by the action of the elements, and shall have provisions for carrying water and normal wind-transported soil matter to the outside. Units shall be designed for windspeeds of not less than 36 meters per second in accordance with ASCE 7. Ventilators shall be free of internal obstructions or moving parts which will require maintenance, and shall be complete with type of mounting indicated on drawings.

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL PROCEDURES:

SD-04 Drawings

Roof Ventilators; FIO.

Dimensioned drawings indicating location of each type of ventilator including details of construction, gauges of metal, and methods of

operation of dampers and controls.

1.4 QUALIFICATION

Manufacturer shall specialize in design and manufacture of the type of roof ventilators specified in this section. Ventilator installer shall be experienced in the installation of ventilator types specified.

1.5 DELIVERY, STORAGE AND HANDLING

Roof ventilators shall be cartoned or crated prior to shipment. Ventilators shall be protected from moisture and damage. Damaged items shall be removed from site.

1.6 PROJECT/SITE CONDITIONS

Rough openings shall be field-measured and recorded on shop drawings prior to fabrication of roof ventilators. Fabrication shall be scheduled with construction schedule.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Aluminum Extrusions

Aluminum extrusions shall be alloy 6063, temper T5 in compliance with ASTM B 221.

2.1.2 Aluminum Sheets

Aluminum sheets shall be alloy 5005, temper H15 or alloy 3003, temper H14 in compliance with ASTM B 209.

2.2 STATIONARY VENTILATORS

Stationary roof ventilators shall be fabricated of aluminum with seamless spun conical-shaped weathercap, and shall have straight-through drainage for eliminating the possibility of air-borne debris collecting in the ventilator openings. Insect screens shall be provided.

2.3 FABRICATION

Ventilators shall be fabricated in accordance with approved shop drawings. Welds, soldered seams, rivets and fasteners shall be clean, secure, watertight, and smooth. Edges shall be wired or beaded, where necessary, to ensure rigidity. Joints between sections shall be watertight and shall allow for expansion and contraction. Galvanic action between different metals in direct contact shall be prevented by nonconductive separators.

2.4 CURB BASES

Ventilator bases for curb-mounted installations shall be of size indicated on drawings, and shall be designed specifically for the type of ventilator and roofing system approved for this project. Curb bases shall be factory-formed and flashed for a watertight installation. Curb bases shall be fabricated of material and finish to match the ventilator.

2.5 SCREENS

Screens shall be furnished by ventilator manufacturer as part of ventilator assembly. Screen (with frames) shall be manufactured of material to match ventilators, and shall be designed to be easily removed for cleaning purposes.

2.6 FINISH

2.6.1 Aluminum Finish

Aluminum roof ventilators shall be factory-finished to match metal roof finish and color.

2.6.2 Color

Color shall be as indicated.

PART 3 EXECUTION

3.1 PREPARATION

Rough openings and other roof conditions shall be prepared in accordance with approved shop drawings and manufacturer's recommendations. Before starting the ventilator work, surrounding roof surfaces shall be protected from damage.

3.2 INSTALLATION

Roof ventilator installation shall be coordinated with roofing work, and shall be installed in accordance with approved shop drawings and manufacturer's published instructions. The ventilator installation shall be watertight and shall be free of vibration noise. Aluminum surfaces shall be protected from direct contact with incompatible materials. Aluminum surfaces which will be in contact with sealant shall not be coated with a protective material. Aluminum shall not be used with copper or with water which flows over copper surfaces. Roof ventilators shall be cleaned in accordance with ventilator manufacturer's recommendations.

3.3 PROTECTION

Exposed ventilator finish surfaces shall be protected against the accumulation of paint, grime, mastic, disfigurement, discoloration and damage for duration of construction activities.

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SECTION 07920

JOINT SEALING

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 509	(1994) Elastomeric Cellular Preformed Gasket and Sealing Material
ASTM C 570	(1994) Oil- and Resin-Base Caulking Compound for Building Construction
ASTM C 734	(1993) Low-Temperature Flexibility of Latex Sealants After Artificial Weathering
ASTM C 834	(1991) Latex Sealants
ASTM C 920	(1987) Elastomeric Joint Sealants
ASTM C 1085	(1991) Butyl Rubber-Based Solvent-Release Sealants
ASTM C 1184	(1991) Structural Silicone-Sealants
ASTM D 217	(1994) Cone Penetration of Lubricating Grease
ASTM D 1056	(1991) Flexible Cellular Materials - Sponge or Expanded Rubber
ASTM D 1565	(1981; R 1990) Flexible Cellular Materials - Vinyl Chloride Polymers and Copolymers (Open-Cell Foam)
ASTM E 84	(1995) Surface Burning Characteristics of Building Materials

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL PROCEDURES:

SD-01 Data

Backing; FIO.

Bond-Breaker; FIO.

Sealant; FIO.

Manufacturer's descriptive data including storage requirements, shelf life, curing time, instructions for mixing and application, and primer data (if required). A copy of the Material Safety Data Sheet shall be provided for each solvent, primer or sealant material.

SD-13 Certificates

Sealant; FIO.

Certificates of compliance stating that the materials conform to the specified requirements.

1.3 ENVIRONMENTAL REQUIREMENTS

The ambient temperature shall be within the limits of 4 to 32 degrees C when the sealants are applied.

1.4 DELIVERY AND STORAGE

Materials shall be delivered to the job in the manufacturer's original unopened containers. The container label or accompanying data sheet shall include the following information as applicable: manufacturer, name of material, formula or specification number, lot number, color, date of manufacture, mixing instructions, shelf life, and curing time at the standard conditions for laboratory tests. Materials shall be handled and stored to prevent inclusion of foreign materials. Materials shall be stored at temperatures between 4 and 32 degrees C unless otherwise specified by the manufacturer.

PART 2 PRODUCTS

2.1 BACKING

Backing shall be 25 to 33 percent oversize for closed cell , unless otherwise indicated.

2.1.1 Rubber Backing

Cellular rubber sponge backing shall be ASTM D 1056, Type 2, closed cell, Class A, Grade 2, round cross section.

2.1.2 Synthetic Rubber Backing

Synthetic rubber backing shall be ASTM C 509, Option I, Type I preformed rods or tubes.

2.2 BOND-BREAKER

Bond-breaker shall be as recommended by the sealant manufacturer to prevent adhesion of the sealant to backing or to bottom of the joint.

2.3 PRIMER

Primer shall be non-staining type as recommended by sealant manufacturer for the application.

2.4 ELASTOMERIC SEALANTS

Elastomeric sealants shall conform to ASTM C 920 and the following:

- a. Polysulfide Sealant [A] : Polysulfide sealant, Type M, Grade P, Class 12.5, Use NT, G.
- b. Polyurethane Sealant [B] : Polyurethane sealant, Grade NS, Class 12.5, Use G.
- c. Silicone Sealant [C]: Silicone sealant, Type S, Grade NS, Class 12.5, Use NT, G.

2.5 PREFORMED SEALANT

Preformed sealant shall be polybutylene or isoprene-butylene based pressure sensitive weather resistant tape or bead sealant capable of sealing out moisture, air and dust when installed as recommended by the manufacturer. At temperatures from minus 34 to plus 71 degrees C, the sealant shall be non-bleeding and shall have no loss of adhesion.

2.5.1 Tape Sealant

Tape sealant: cross-section dimensions shall be as required.

2.5.2 Bead Sealant

2.5.3 Foam Strip

Foam strip shall be polyurethane foam; cross-section dimensions shall be as required. Foam strip shall be capable of sealing out moisture, air, and dust when installed and compressed as recommended by the manufacturer. Service temperature shall be minus 40 to plus 135 degrees C. Untreated strips shall be furnished with adhesive to hold them in place. Adhesive shall not stain or bleed into adjacent finishes. Treated strips shall be saturated with butylene waterproofing or impregnated with asphalt.

2.6 SOLVENTS AND CLEANING AGENTS

Solvents, cleaning agents, and accessory materials shall be provided as recommended by the manufacturer.

PART 3 EXECUTION

3.1 GENERAL

3.1.1 Surface Preparation

The surfaces of joints to be sealed shall be dry. Oil, grease, dirt, chalk, particles of mortar, dust, loose rust, loose mill scale, and other foreign substances shall be removed from surfaces of joints to be in contact with the sealant. Oil and grease shall be removed with solvent and surfaces shall be wiped dry with clean cloths.

3.1.2 Concrete and Masonry Surfaces

Where surfaces have been treated with curing compounds, oil, or other such materials, the materials shall be removed by sandblasting or wire brushing. Laitance, efflorescence and loose mortar shall be removed from the joint

cavity.

3.1.3 Steel Surfaces

Steel surfaces to be in contact with sealant shall be sandblasted or, if sandblasting would not be practical or would damage adjacent finish work, the metal shall be scraped and wire brushed to remove loose mill scale. Protective coatings on steel surfaces shall be removed by sandblasting or by a solvent that leaves no residue.

3.1.4 Aluminum Surfaces

Aluminum surfaces to be in contact with sealants shall be cleaned of temporary protective coatings. When masking tape is used for a protective cover, the tape and any residual adhesive shall be removed just prior to applying the sealant. Solvents used to remove protective coating shall be as recommended by the manufacturer of the aluminum work and shall be non-staining.

3.2 APPLICATION

3.2.1 Masking Tape

Masking tape shall be placed on the finish surface on one or both sides of a joint cavity to protect adjacent finish surfaces from primer or sealant smears. Masking tape shall be removed within 10 minutes after joint has been filled and tooled.

3.2.2 Backing

Backing shall be installed to provide the indicated sealant depth. The installation tool shall be shaped to avoid puncturing the backing.

3.2.3 Bond-Breaker

Bond-breaker shall be applied to fully cover the bottom of the joint without contaminating the sides where sealant adhesion is required.

3.2.4 Primer

Primer shall be used on concrete masonry units, wood, or other porous surfaces in accordance with instructions furnished with the sealant. Primer shall be applied to the joint surfaces to be sealed. Surfaces adjacent to joints shall not be primed.

3.2.5 Sealant

Sealant shall be used before expiration of shelf life. Multi-component sealants shall be mixed according to manufacturer's printed instructions. Sealant in guns shall be applied with a nozzle of proper size to fit the width of joint. Joints shall be sealed as detailed in the drawings. Sealant shall be forced into joints with sufficient pressure to expel air and fill the groove solidly. Sealant shall be installed to the indicated depth without displacing the backing. Unless otherwise indicated, specified, or recommended by the manufacturer, the installed sealant shall be tooled so that the surface is uniformly smooth and free of wrinkles and to assure full adhesion to the sides of the joint. Sealants shall be installed free of air pockets, foreign embedded matter, ridges and sags. Sealer shall be applied over the sealant when and as specified by the

sealant manufacturer.

3.3 CLEANING

The surfaces adjoining the sealed joints shall be cleaned of smears and other soiling resulting from the sealant application as work progresses.

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SECTION 08110

STEEL DOORS AND FRAMES

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 236	(1989; R 1993) Steady-State Thermal Performance of Building Assemblies by Means of a Guarded Hot Box
ASTM C 976	(1990) Thermal Performance of Building Assemblies by Means of a Calibrated Hot Box
ASTM D 2863	(1991) Measuring the Minimum Oxygen Concentration to Support Candle-Like Combustion of Plastics (Oxygen Index)
ASTM E 90	(1990) Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions
ASTM E 152	(1981a) Fire Tests of Door Assemblies
ASTM E 283	(1991) Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen

DOOR AND HARDWARE INSTITUTE (DHI)

DHI-A115.IG Hardware	(1994) Installation Guide for Doors and
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NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)

NAAMM HMMA 862	(1987) Hollow Metal Manual; Section: Guide Specifications for Commercial Security Hollow Metal Doors and Frames
NAAMM HMMA 865	(1992) Hollow Metal Manual; Section: Guide Specifications for Swinging Sound Control Hollow Metal Doors and Frames

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 80	(1992) Fire Doors and Windows
NFPA 80A	(1993) Protection of Buildings from

Exterior Fire Exposures

NFPA 101 (1994) Safety to Life from Fire in Buildings and Structures

STEEL DOOR INSTITUTE (SDOI)

SDOI SDI-100 (1991) Standard Steel Doors and Frames
 SDOI SDI-106 (1991) Standard Door Type Nomenclature
 SDOI SDI-107 (1984) Hardware on Steel Doors
 (Reinforcement - Application)

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL PROCEDURES:

SD-04 Drawings

Steel Doors and Frames; FIO.

Drawings using standard door type nomenclature in accordance with SDOI SDI-106 indicating the location of each door and frame, elevation of each model of door and frame, details of construction, method of assembling sections, location and extent of hardware reinforcement, hardware locations, type and location of anchors for frames, and thicknesses of metal. Drawings shall include catalog cuts or descriptive data for the doors, frames, and weatherstripping including air infiltration data and manufacturers printed instructions.

SD-09 Reports

Fire Rated Doors; FIO.

A letter by a nationally recognized testing laboratory which identifies the product manufacturer, type, and model; certifying that the laboratory has tested a sample assembly in accordance with ASTM E 152 and issued a current listing for same.

SD-13 Certificates

Fire Rated Doors; FIO. Thermal Insulated Doors; FIO.

- a. Certification of Oversized Fire Doors: Certificates of compliance in accordance with the requirements of ASTM E 152 for fire doors exceeding the sizes for which label service is available.
- b. Certification of Thermal Insulating Rating: Certification or test report for thermal insulated doors shall show compliance with the specified requirements. The certification, or test report, shall list the parameters and the type of hardware and perimeter seals used to achieve the rating.

SD-14 Samples

Steel Doors and Frames; FIO.

Manufacturer's standard color samples of factory applied finishes.

1.3 DELIVERY AND STORAGE

During shipment, welded unit type frames shall be strapped together in pairs with heads at opposite ends or shall be provided with temporary steel spreaders at the bottom of each frame; and knockdown type frames shall be securely strapped in bundles. Materials shall be delivered to the site in undamaged condition, and stored out of contact with the ground and under a weathertight covering permitting air circulation. Doors and assembled frames shall be stored in an upright position in accordance with DHI-A115.IG. Abraded, scarred, or rusty areas shall be cleaned and touched up with matching finishes.

1.4 WARRANTY

Manufacturer's standard performance guarantees or warranties that extend beyond a 1 year period shall be provided.

PART 2 PRODUCTS

2.1 DOORS AND FRAMES

Doors and frames shall be factory fabricated in accordance with SDOI SDI-100 and the additional requirements specified herein. Door grade shall be extra heavy duty (Grade III) unless otherwise indicated on the door and door frame schedules. Exterior doors and frames shall be designation G60 galvanized. Indicated interior door and frame shall be designation G60 galvanized. Doors and frames shall be prepared to receive hardware conforming to the templates and information provided under Section 08700 BUILDERS' HARDWARE. Doors and frames shall be reinforced, drilled, and tapped to receive mortised hinges, locks, latches, and flush bolts as required. Doors and frames shall be reinforced for surface applied hardware. Frames shall be welded type located as shown. Door frames shall be furnished with a minimum of three jamb anchors and one floor anchor per jamb. Anchors shall be not less than 1.2 mm (18 gauge) steel or 4.5 mm (7 gauge) diameter wire. For wall conditions that do not allow the use of a floor anchor, an additional jamb anchor shall be provided. Rubber silencers shall be furnished for installation into factory predrilled holes in door frames; adhesively applied silencers are not acceptable. Reinforcing of door assemblies for closers and other required hardware shall be in accordance with SDOI SDI-100 and the conditions of the fire door assembly listing when applicable. Exterior doors shall have top edges closed flush and sealed against water penetration.

2.2 FIRE RATED DOORS

Fire rated door assemblies shall bear the listing identification label of a nationally recognized testing laboratory qualified to perform tests of fire door assemblies in accordance with ASTM E 152 and having a listing for the tested assemblies. The fire resistance rating shall be 1-1/2 hr (B). Doors exceeding the sizes for which listing label service is offered shall be in accordance with ASTM E 152. Listing identification labels shall be constructed and permanently applied by a method which results in their destruction should they be removed.

2.3 THERMAL INSULATED DOORS

The interior of thermal insulated doors shall be completely filled with rigid plastic foam permanently bonded to each face panel. The thermal conductance (U-value) through the door shall not exceed RSI-3.3 when tested as an operational assembly in accordance with ASTM C 236 or ASTM C 976. Doors with cellular plastic cores shall have a minimum oxygen index rating of 22 percent when tested in accordance with ASTM D 2863.

2.4 WEATHERSTRIPPING

Unless otherwise specified in Section 08700 BUILDERS' HARDWARE, weatherstripping shall be as follows: Weatherstripping for head and jamb shall be manufacturer's standard elastomeric type of synthetic rubber, vinyl, or neoprene and shall be installed at the factory or on the jobsite in accordance with the door frame manufacturer's recommendations. Weatherstripping for bottom of doors shall be as shown. Air leakage rate of weatherstripping shall not exceed 0.31 l/s per linear meter (0.20 cfm per linear foot) of crack when tested in accordance with ASTM E 283 at standard test conditions.

PART 3 EXECUTION

3.1 INSTALLATION

Installation shall be in accordance with DHI-A115.IG. Preparation for surface applied hardware shall be in accordance with SDOI SDI-107. Rubber silencers shall be installed in door frames after finish painting has been completed; adhesively applied silencers are not acceptable. Weatherstripping shall be installed at exterior door openings to provide a weathertight installation. Installation and operational characteristics of fire doors shall be in accordance with NFPA 80, NFPA 80A and NFPA 101.

3.1.1 Thermal Insulated Doors

Hardware and perimeter seals shall be adjusted for proper operation. Doors shall be sealed weathertight after installation of hardware and shall be in accordance with Section 07920 JOINT SEALING.

3.2 FIELD PAINTED FINISH

Steel doors and frames shall be field painted in accordance with Section 09900 PAINTING, GENERAL. Weatherstrips shall be protected from paint. Finish shall be free of scratches or other blemishes. Color shall be as indicated.

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SECTION 08700
BUILDERS' HARDWARE

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM E 283	(1991) Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors Under Specified Pressure Differences Across the Specimen
ASTM F 883	(1990) Padlocks

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

BHMA-01	(Effective thru Jun 1995) Directory of Certified Locks & Latches
BHMA-02	(Effective thru Jul 1995) Directory of Certified Door Closers
BHMA-03	(Effective thru Jul 1996) Directory of Certified Exit Devices
BHMA A156.1	(1988) Butts and Hinges
BHMA A156.2	(1989) Bored and Preassembled Locks and Latches
BHMA A156.3	(1994) Exit Devices
BHMA A156.4	(1992) Door Controls - Closers
BHMA A156.5	(1992) Auxiliary Locks & Associated Products
BHMA A156.6	(1994) Architectural Door Trim
BHMA A156.7	(1988) Template Hinge Dimensions
BHMA A156.8	(1994) Door Controls - Overhead Holders
BHMA A156.13	(1994) Mortise Locks & Latches
BHMA A156.15	(1995) Closer Holder Release Devices
BHMA A156.16	(1989) Auxiliary Hardware

BHMA A156.18 (1993) Materials and Finishes

BHMA A156.23 (1992) Electromagnetic Locks

DOOR AND HARDWARE INSTITUTE (DHI)

DHI-03 (1989) Keying Systems and Nomenclature

DHI-04 (1976) Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames

DHI-05 (1990) Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames

DHI-A115.IG (1994) Installation Guide for Doors and Hardware

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 80 (1995) Fire Doors and Windows

NFPA 101 (1994) Safety to Life from Fire in Buildings and Structures

NFPA 105 (1993) Smoke-Control Door Assemblies

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL PROCEDURES:

SD-01 Data

Hardware and Accessories; GA.

Manufacturer's descriptive data, technical literature, catalog cuts, and installation instructions. Spare parts data for locksets, exit devices, closers, electric locks, electric strikes, electro-magnetic closer holder release devices, and electric exit devices, after approval of the detail drawings, and not later than 1month(s) prior to the date of beneficial occupancy. The data shall include a complete list of parts and supplies, with current unit prices and source of supply.

SD-04 Drawings

Hardware Devices; GA.

Detail drawings for hardware devices for computerized keying systems, magnetic cards, keyless push button access control systems, and other electrical hardware devices showing complete wiring and schematic diagrams and other details required to demonstrate proper function of units.

SD-07 Schedules

Hardware Schedule; GA.

Hardware schedule listing all items to be furnished. The schedule shall include for each item: the quantities; manufacturer's name and catalog numbers; the ANSI number specified, sizes; detail information or catalog cuts; finishes; door and frame size and materials; location and hardware set identification cross-references to drawings; corresponding reference standard type number or function number from manufacturer's catalog if not covered by ANSI or BHMA; and list of abbreviations and template numbers.

Keying Schedule; GA.

Keying schedule developed in accordance with DHI-03, after the keying meeting with the user.

SD-19 , Operation and Maintenance Manuals
Hardware and Accessories; FIO

Six copies of maintenance instructions listing routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guides. The instructions for electric locks, electric strikes, electro-magnetic closer holder release devices, and electric exit devices shall include simplified diagrams as installed.

SD-13 Certificates

Hardware and Accessories; FIO.

The hardware manufacturer's certificates of compliance stating that the supplied material or hardware item meets specified requirements. Each certificate shall be signed by an official authorized to certify in behalf of the product manufacturer and shall identify quantity and date or dates of shipment or delivery to which the certificates apply. A statement that the proposed hardware items appear in BHMA-01, BHMA-02 and BHMA-03 directories of certified products may be submitted in lieu of certificates.

1.3 PREDELIVERY CONFERENCE

Upon approval of the Hardware Schedule, the construction Contractor shall arrange a conference with the hardware supplier, Contracting Officer and the using agency to determine keying system requirements. Location of the key control storage system, set-up and key identification labeling will also be determined.

1.4 DELIVERY, STORAGE, AND HANDLING

Hardware shall be delivered to the project site in the manufacturer's original packages. Each article of hardware shall be individually packaged in the manufacturer's standard commercial carton or container, and shall be properly marked or labeled to be readily identifiable with the approved hardware schedule. Each change key shall be tagged or otherwise identified with the door for which its cylinder is intended. Where double cylinder functions are used or where it is not obvious which is the key side of a door, appropriate instructions shall be included with the lock and on the hardware schedule. Manufacturer's printed

installation instructions, fasteners, and special tools shall be included in each package.

1.5 SPECIAL TOOLS

Special tools, such as those supplied by the manufacturer, unique wrenches, and dogging keys, shall be provided as required to adjust hardware items.

1.6 WARRANTY

Manufacturer's standard performance guarantees or warranties that extend beyond a one year period shall be provided.

1.7 OPERATION AND MAINTENANCE MANUALS

Six complete copies of maintenance instructions listing routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guides shall be provided. The instructions for electro-magnetic locks shall include simplified diagrams as installed.

PART 2 PRODUCTS

2.1 GENERAL HARDWARE REQUIREMENTS

Hardware shall conform to the requirements specified herein and the HARDWARE SETS listing at the end of this section. Hardware set numbers correspond to the set numbers shown on the drawings.

2.2 TEMPLATES

Requirements for hardware to be mounted on metal doors or metal frames shall be coordinated between hardware manufacturer and door or frame manufacturer by use of templates and other information to establish location, reinforcement required, size of holes, and similar details. Templates of hinges shall conform to BHMA A156.7.

2.3 HINGES

Hinges shall conform to BHMA A156.1. Hinges used on metal doors and frames shall also conform to BHMA A156.7. Except as otherwise specified, hinge sizes shall conform to the hinge manufacturer's printed recommendations and shall be indicated on the Contractor's hardware schedule. Provide two hinges for doors up to 5 feet high, three hinges for doors 5 feet to 7 feet 6 inches and one additional hinge for every additional 30 inches or fraction thereof in height unless otherwise noted.

2.3.1 Hinges for outswinging exterior doors with closers.

Provide one pair of custom designed hinges with non-removable pins. Each hinge shall be of the antifriction design and have the capacity in both radial and thrust to support a 2500 pound door. The hinges shall be designed for the door Hinges for reverse bevel doors with locks shall have pins that are made nonremovable by means such as a set screw in the barrel, or safety stud, when the door is in the closed position.

2.3.2 Contractor's Option

Hinges with antifriction bearings may be furnished in lieu of ball bearing

hinges, except where prohibited for fire doors by the requirements of NFPA 80.

2.4 LOCKS AND LATCHES

To the maximum extent possible, locksets, latchsets and deadlocks shall be the products of a single manufacturer. Lock fronts for double-acting doors shall be rounded.

2.4.1 Mortise Lock and Latchsets

Mortise lock, latchsets, and strikes shall be series 1000 and shall conform to BHMA A156.13, operational Grade 1. Strikes for security doors shall be rectangular without curved lip. Mortise type locks and latches for doors 44 mm thick and over shall have adjustable bevel fronts or otherwise conform to the shape of the door. Mortise locks shall have armored fronts.

2.4.2 Auxiliary Locks and Associated Products

Mortise dead locks and dead latches, narrow style dead locks and dead latches, rim latches, dead latches, and dead bolts, and electric strikes shall conform to BHMA A156.5. Strike boxes shall be furnished with dead bolt and latch strikes for Grade 1.

2.4.3 Lock Cylinders (Mortise, Rim and Bored)

Lock cylinders shall comply with BHMA A156.5. Lock cylinder shall have not less than six pins. Cylinders shall have key removable type cores. A grand master keying system shall be provided. Construction interchangeable cores shall be provided. Disassembly of knob or lockset shall not be required to remove core from lockset. All locksets, and exit devices shall accept same interchangeable cores.

2.4.4 Lock Trim

Lock trim shall be cast, forged, or heavy wrought construction of commercial plain design. In addition to meeting the test requirement of BHMA A156.2 or BHMA A156.13, lever handles, roses, and escutcheons shall be 1.27 mm thick, if unreinforced. If reinforced, the outer shell shall be 0.89 mm thick and the combined thickness shall be 1.78 mm except that knob shanks shall be 1.52 mm thick. Knob diameter shall be 54 to 57 mm.. Lever handles shall be of plain design with ends returned to no more than 10 mm from the door face.

2.4.5 Electromagnetic Locks

unlocking of doors
Electromagnetic locks shall be fail safe (unlocked when power is off) and shall conform to BHMA A156.23. In hazardous locations, products shall use safe power supplies.

2.4.11 Three Position Combination Lock

Door Number 5 shall be secured with an insert dial type three position changeable lock with interior safety release.

2.5 EXIT DEVICES AND EXIT DEVICE ACCESSORIES

Exit devices and exit device accessories shall conform to BHMA A156.3, Grade 1.

2.5.1 Exit Devices and Auxiliary Items

Trim shall be of wrought construction and commercial plain design with straight, beveled, or smoothly rounded sides, corners, and edges. Adjustable strikes shall be provided for rim type and vertical rod devices. Open back strikes shall be provided for pairs of doors with mortise and vertical rod devices; except open back strikes shall be used on labeled doors only where specifically provided for in the published listings. Touch bars shall be provided in lieu of conventional crossbars and arms. Escutcheons shall be provided not less than 175 by 55 mm. Escutcheons shall be cut to suit cylinders and operating trim.

2.5.2 KEYING

Locks shall be keyed in sets or subsets as scheduled. Change keys for locks shall be stamped with change number and the inscription "U.S. Property - Do Not Duplicate." Master keying unless noted otherwise shall be compatible with or equal to Yale VYX Series six pin) tumblers and removable core locks. All keying shall be done at the factory. All locks shall be furnished with removable core cylinders. Removable core cylinder is interpreted to be a cylinder exchanged through the face of knob by means of a control key. All locks unless noted otherwise shall be grand master keyed and submastered as directed by the Hill Air Force Base Civil Engineer, DEMBS, thru DEEC. All interior and exterior doors shall be keyed as directed by the Hill AFB Civil Engineer, to DEMBS thru DEEC. Also, all submittals/shop drawings referring to Keys and Keying shall be submitted to The Hill AFB Civil Engineer, to DEMBS thru DEEC for coordination and approval.

The Mechanical Room (Door No. 6) shall be master keyed into the existing master keying system GGM #20631 and GGM #R20633.

The Contractor shall coordinate the keying schedule through the Base Civil Engineer a minimum of four months before the scheduled project completion. The Base Civil Engineer will approve the keying schedule and return it to the Corps of Engineers Project Manager in sufficient time for the contractor to order the cores. The contractor shall deliver all permanent locking hardware (keys and permanent cores) to the Hill AFB Corps of Engineers Resident Office. Upon final acceptance of the building by the Contracting Officer, Hill AFB Civil Engineer, DEMBS, personnel will remove the temporary construction cores and insert the permanent key cores. Keys shall be supplied as follows:

Locks: 2 change keys each lock.

For simplification of custodial operations, mechanical room shall be master keyed into existing master keying system.

The keys shall be furnished to the Contracting Officer arranged for key control system storage in sets or subsets as scheduled.

2.5.3 DOOR CLOSING DEVICES

Door closing devices shall conform to BHMA A156.4, Grade 1. Closing

devices shall be products of one manufacturer for each type specified. The opening resistance of closing devices shall not exceed 67 N applied at the latch stile or exceed 22 N where low opening resistance is scheduled.

2.5.3.1 Surface Type Closers

Surface type closers shall be Grade 1, Series C03000 with options PT-4C Except as otherwise specified, sizes shall conform to the manufacturer's published recommendations. Closers for outswinging exterior doors shall have parallel arms or shall be top jamb mounted.

2.5.4 DOOR CONTROLS - OVERHEAD HOLDERS

Door controls - overhead holders shall conform to BHMA A156.8.

2.5.5 ARCHITECTURAL DOOR TRIM

Architectural door trim shall conform to BHMA A156.6 and as shown on drawings..

2.5.5.1 Door Pulls and Push/Pull Units

2.5.5.1.1 Arm Pulls

Arm pulls shall be Category J400, double base, stainless steel.

2.6 Door Pulls

Door pulls shall be Category J400 stainless steel of plain modern design. Pulls for hollow metal or kalamein doors shall be Type J405 thru-bolted to Type J301 flat push plates.

2.7 MISCELLANEOUS

2.7.1 Neoprene Weatherseals

Weatherseals of the type indicated on drawings. Air leakage rate of weatherstripping shall not exceed 0.775 liters per second per lineal meter of crack when tested in accordance with ASTM E 283 at standard test conditions.

2.7.2 Gasketing

Gasketing shall be a compression type seal, silicon based, self-adhesive product for use on steel door frames with steel doors for 1-1/2 hour B-label. Color shall be bronze.. Air leakage rate of weatherstripping shall not exceed 0.775 liters per second per lineal meter of crack when tested in accordance with ASTM E 283 at standard test conditions.

2.7.3 Key Control Storage System

Key control storage system shall conform to BHMA A156.5, and shall be properly labeled for key identification. Set up, identification labeling and location of the key control storage shall be as directed at the Predelivery Conference.

2.8 FASTENINGS

Fastenings of proper type, size, quantity, and finish shall be supplied with each article of hardware. Machine screws and expansion shields shall be used for attaching hardware to concrete or masonry. Fastenings exposed to the weather in the finished work shall be of brass, bronze, or stainless steel. Sex bolts, through bolts, or machine screws and grommet nuts, where used on reverse-bevel exterior doors equipped with half-surface or full-surface hinges, shall employ one-way screws or other approved tamperproof screws. Screws for the jamb leaf of half-mortise and full-surface hinges attached to structural steel frames shall be one-way or other approved tamperproof type.

2.9 FINISHES

Unless otherwise specified, finishes shall conform to those identified in BHMA A156.18. Where painting of primed surfaces is required, painting is specified in Section 09900 PAINTING, GENERAL.

Hinges	-	630 (Satin Stainless Steel)
Lock and trim	-	630 (Satin Stainless Steel)
Closers	-	692 (Tan Painted)
Misc. Hardware	-	630 (Satin Stainless Steel)

2.10 HARDWARE FOR FIRE DOORS

Hardware for fire doors shall conform to the requirements of NFPA 80 and NFPA 101.

PART 3 EXECUTION

3.1 APPLICATION

Hardware shall be located in accordance with DHI-04 and DHI-05. When approved, slight variations in locations or dimensions will be permitted. Application shall be in accordance with DHI-A115.IG or DHI A115-W. Door control devices for exterior doors such as closers and holders, shall be attached to doors with thru bolts and nuts or sex bolts. Alternate fastening methods may be approved by the Contracting Officer when manufacturers' documentation is submitted to verify that the fastening devices and door reinforcements are adequate to resist wind induced stresses. Electric hardware items and access control devices shall be installed in accordance with manufacturer's printed installation procedures.

3.1.1 Hardware for Fire Doors and Smoke-Control Door Assemblies

Hardware for fire doors shall be installed in accordance with the requirements of NFPA 80. Exit devices installed on fire doors shall have a visible label bearing the marking "Fire Exit Hardware". Other hardware installed on fire doors, such as locksets, closers, and hinges shall have a visible label or stamp indicating that the hardware items have been approved by an approved testing agency for installation on fire-rated doors. Hardware for smoke-control door assemblies shall be installed in accordance with NFPA 105.

3.1.2 Door-Closing Devices

Door-closing devices shall be installed and adjusted in accordance with the templates and printed instructions supplied by the manufacturer of the

devices. Insofar as practicable, doors opening to or from halls and corridors shall have the closer mounted on the room side of the door.

3.1.3 Key Control Storage Systems

Key control storage system shall be furnished to the Contracting Officer.

3.1.3.1 Auxiliary Hardware

Lever extension flush bolts shall be installed at the top and bottom of the inactive leaf of pairs of doors. The bottom bolt shall operate into a dust-proof floor strike or threshold.

3.1.3.1.1 Weatherseals

Weatherseals shall be located as indicated, snug to door face and fastened in place with color matched metal screws after door and frames have been finish painted. Screw spacing shall be as recommended by manufacturer.

3.2 Gasketing

Gasketing shall be installed at the inside edge of the hinge and head and latch sides of door frame. Frames shall be toleranced for a 3 mm clearance between door and frame. Frames shall be treated with tape primer prior to installation.

3.3 OPERATIONAL TESTS

Prior to acceptance of any electrical hardware system, an operational test shall be performed to determine if devices are operating as intended by the specifications. Wiring shall be tested for correct voltage, current carrying capacity, and proper grounding. Stray voltages in lock wiring shall be eliminated to prevent locking devices from releasing in critical situations.

3.4 HARDWARE SETS

HW-1

2 EA.	Hinges, (As described in paragraph 2.3)
1 EA.	Exit Device, Type 28, Function 13 (automatic dead bolt)With Cylinder Lock, E09221
1 EA.	Closer, C02021 (with Hold Open and positive stop features)
1 EA.	Door Pull, J400
1 EA.	Electromagnetic Lock (As described in paragraph 2.4.5)

HW-2

2 EA.	Hinges, (As described in paragraph 2.3)
1 EA.	Exit Device, Type 09, Function 01 (automatic dead bolt)
1 EA.	Closer, C02021 (with Hold Open and positive stop features)
1 EA.	Door Pull, J400
1 EA.	Electromagnetic Lock (As described in paragraph 2.4.5)

HW--3

	3 EA.	Hinges, A8111
	1 EA.	Closer, C03021 (with Hold open and positive stop features)
equal	1 EA.	Surface mounted Heavy Duty lockset with 4-point Bolt system (no trim, lever or lock,etc. at Mechanical Room side of door) Similar to Securitech Model No. 4800 or
	1 EA.	Passage Latch Set (no trim, lever etc at Mechanical Room side of door)

HW-4

HARDWARE SHALL BE PROVIDED BY BLAST DOOR MANUFACTURER.

HW-5

	2 EA.	Hinges, (As described in paragraph 2.3)
	1 EA	Exit Device, Type 28, Function 01 (automatic Dead Bolt)
	1 EA	Closer, C02021 (with Hold open and positive stop features)
	1 EA.	Door pull, J400
	1 EA.	Electromagnetic Lock (As described in paragraph 2.4.5)

NOTE: SEE DRAWINGS FOR ADDITIONAL REQUIREMENTS FOR PADLOCKS,
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 - 1.7.1 SSPC-PA 3, A Guide for Safety in Paint Application
 - 1.7.2 The manufacturer's Material Safety Data Sheets (MSDS). Use impermeable gloves, chemical goggles or faceshield, and other protective clothing and equipment as recommended by the coating manufacturer to prevent exposure to hazardous materials.
 - 1.7.3 29 CFR 1910
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 - 3.2.5.1 The term "touch-up painting" refers to the application of paint on small areas of painted surfaces to repair mars, scratches, and small areas where the coating has deteriorated in order to restore the coating to an unbroken condition.
 - 3.2.5.2 Damaged finished surfaces of factory-coated equipment, components, etc., shall be touched-up to match original finish with the same type finish coating as applied at the factory.

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SECTION 09900

PAINTING, GENERAL

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS (ACGIH)

ACGIH-02	(1993) 1993-1994 Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices
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AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 150	(1995) Portland Cement
ASTM D 3273	(1994) Resistance to Growth of Mold on the Surface of Interior Coating in an Environmental Chamber
ASTM D 3274	(1995) Evaluating Degree of Surface Disfigurement of Paint Films by Microbial (Fungal or Algal) Growth or Soil and Dirt Accumulation
ASTM D 4214	(1989) Evaluating the Degree of Chalking of Exterior Paint Films
ASTM D 4258	(1983; R 1992) Surface Cleaning Concrete for Coating

CODE OF FEDERAL REGULATIONS

29 CFR 1910 Occupational Safety and Health Standards

U.S. ARMY CORPS OF ENGINEERS PUBLICATION
EM 385-1-1 (1992) Safety and Health Requirements Manual

Ref Id	Ref Title
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COMMERCIAL ITEM DESCRIPTIONS (CID)

CID A-A-1500	(Rev A) Sealer, Surface (Latex Block Filler)
CID A-A-1546	(Rev A) Rubbing Varnish
CID A-A-2246	(Rev A) Paint, Latex (Gloss, Interior)
CID A-A-2247	(Basic) Paint, Latex (Semigloss, Interior)

CID A-A-2248	(Basic) Paint, Latex, (Flat, Interior)
CID A-A-2336	(Basic) Primer Coating (Oil-Alkyd, Exterior Wood, White and Tints)
CID A-A-2340	(Basic) Primer Coating (Latex, White, for Gypsum Wallboard)
CID A-A-2834	(Rev A) Urethane, Waterborne (Low VOC, Clear)

FEDERAL AVIATION ADMINISTRATION (FAA)

FAA AC 70/7460-1	(Rev J) Obstruction Marking and Lighting
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FEDERAL SPECIFICATIONS (FS)

FS TT-C-535	(Rev B; Am 2) Coating, Epoxy, Two Component, for Interior Use on Metal, Wood, Wallboard, Painted Surfaces Concrete and Masonry
FS TT-C-542	(Rev E) Coating, Polyurethane, Oil-Free, Moisture Curing
FS TT-C-555	(Rev B; Am 1) Coating, Textured (for Interior and Exterior Masonry Surfaces)
FS TT-E-489	(Rev J) Enamel, Alkyd, Gloss, Low VOC Content
FS TT-E-2784	(Rev A; Am 1) Enamel (Acrylic-Emulsion, Exterior Gloss and Semigloss)
FS TT-P-19	(Rev D) Paint, Latex (Acrylic Emulsion, Exterior Wood and Masonry)
FS TT-P-28	(Rev G) Paint, Aluminum, Heat Resisting (1200 Degrees F.)
FS TT-P-38	(Rev E) Paint, Aluminum (Ready-Mixed)
FS TT-P-645	(Rev B) Primer, Paint, Zinc-Molybdate, Alkyd Type

FS TT-P-001984	(Basic) Primer Coating, Latex Base, Exterior, (Undercoat for Wood), White and Tints
FS TT-S-176	(Rev E; Am 1) Sealer, Surface, Varnish Type, Floor Wood or Cork
FS TT-S-223	(Rev B; Notice 2) Sealer, Surface, Floor, Water Emulsion Type
FS TT-S-708	(Rev A; Am 2) Stain, Oil; Semi-Transparent, Wood, Exterior
FS TT-S-001992	(Basic) Stain, Latex, Exterior for Wood Surfaces
FS TT-V-119	(Rev D; Am 2) Varnish, Spar, Phenolic-Resin
FS TT-V-121	(Rev H) Varnish, Spar, Water-Resisting

MAPLE FLOORING MANUFACTURERS ASSOCIATION (MFMA)

MFMA-03	(1994) Floor Finish List and Specifications for Heavy Duty and Gymnasium Finishes for Maple, Beech and Birch Floors: MFMA Floor Finish List Number 11
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STEEL STRUCTURES PAINTING COUNCIL (SSPC)

SSPC Paint 5	(1995) Zinc Dust, Zinc Oxide and Phenolic Varnish Paint
SSPC Paint 18	(1991) Chlorinated Rubber Intermediate Coat Paint
SSPC Paint 20	(1991) Zinc-Rich Primers (Type I - Inorganic and Type II - Organic)
SSPC Paint 25	(1991) Red Iron Oxide, Zinc Oxide, Raw Linseed Oil and Alkyd Primer (without Lead and Chromate Pigments)
SSPC Paint 26	(1991) Slow Drying Linseed Oil Black Maintenance Primer (Without Lead and Chromate Pigments)
SSPC PA 3	(1982) Paint Application Guide No. 3, A Guide to Safety in Paint Application
SSPC SP 1	(1982) Solvent Cleaning

SSPC SP 2	(1995) Hand Tool Cleaning
SSPC SP 3	(1995) Power Tool Cleaning
SSPC SP 6	(1994) Commercial Blast Cleaning
SSPC SP 7	(1994) Brush-Off Blast Cleaning

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL PROCEDURES:

SD-01 Data

Paint; FIO.

The names, quantity represented, and intended use for the proprietary brands of materials proposed to be substituted for the specified materials regardless of quantities in states where VOC content limitations apply.

Manufacturer's Proprietary (Off-Shelf) Alternate Materials to the Referenced Federal Specification Materials; FIO.

Regardless of quantities, in areas controlled by Volatile Organic Compound (VOC and/or Low VOC) content limitations, and where manufacturers do not formulate paint materials to the exact composition criteria in order to meet VOC regulations, manufacturers alternate products may be acceptable in lieu of the specified Federal Specification materials. The Federal Specification materials are listed for identification purposes and serve to indicate the quality of the materials which the manufacturers alternate products must meet. Samples shall be taken and shall be retained by the Government for possible performance testing should it be deemed necessary.

SD-06 Instructions

Mixing and Thinning; FIO. Application; FIO.

Manufacturer's current printed product description, material safety data sheets (MSDS) and technical data sheets for each coating system. Detailed mixing, thinning and application instructions, minimum and maximum application temperature, and curing and drying times between coats for epoxy, moisture-curing polyurethane, and liquid glaze coatings. Detailed application instructions for textured coatings shall be provided.

SD-09 Reports

Paint; FIO.

A statement as to the quantity represented and the intended use, plus the following test report for batches in excess of 200 L:

- a. A test report showing that the proposed batch to be used meets all specification requirements, or:
- b. A test report showing that a previous batch of the same

formulation as the batch to be used met all specification requirements, plus, on the proposed batch to be used, a report of test results for properties of weight per liter, viscosity, fineness of grind, drying time, color, and gloss.

SD-13 Certificates

Lead; FIO. Volatile Organic Compound (VOC) Content; FIO.

Certificate stating that paints for interior use contain no mercurial mildewcide or insecticide. Certificate stating that paints proposed for use contain not more than 0.06 percent lead by weight of the total nonvolatile. Certificate stating that paints proposed for use meet Federal VOC regulations and those of the of the local Air Pollution Control Districts having jurisdiction over the geographical area in which the project is located.

SD-14 Samples

Moisture-curing Polyurethane; FIO.

A complete moisture-curing polyurethane system applied to a panel of the same material as that on which the coating will be applied in the work and for each color specified. The sample panels will be used for quality control in applying the system.

Paint; FIO.

While the material is at the site or source of supply, and at a time agreeable to the Contractor and the Contracting Officer, a 1 liter sample of each color and batch, except for quantities of 200 liters or less, shall be taken by random selection from the sealed containers by the Contractor in the presence of a representative of the Contracting Officer.

The contents of the containers to be sampled shall be thoroughly mixed to ensure that the sample is representative. Samples shall be identified by designated name, specification number, manufacturer name and address, batch number, project contract number, intended use, and quantity involved.

Paint Chip Color Samples; FIO.

The Contractor shall furnish a paint chip color sample for all proposed finish coatings. Each paint chip shall be identified, as applicable, by Federal Specification, Federal Standard 595, or the manufacturers product number, and the intended use. Color samples for stains shall be submitted on wood of the same species, color, and texture, as that of the wood to receive stain.

1.3 PACKAGING, LABELING, AND STORING

Paints shall be in sealed containers that legibly show the designated name, formula or specification number, batch number, color, quantity, date of manufacture, manufacturer's formulation number, manufacturer's directions including any warnings and special precautions, and name of manufacturer. Pigmented paints shall be furnished in containers not larger than 20 liters. Paints and thinner shall be stored in accordance with the manufacturer's written directions and as a minimum stored off the ground, under cover, with sufficient ventilation to prevent the buildup of flammable vapors and at temperatures between 4 and 35 degrees C. Paints shall be stored on the project site or segregated at the source of supply

sufficiently in advance of need to allow 30 days for testing.

1.4 APPROVAL OF MATERIALS

When samples are tested, approval of materials will be based on tests of the samples; otherwise, materials will be approved based on test reports furnished with them. If materials are approved based on test reports furnished, samples will be retained by the Government for testing should the materials appear defective during or after application. In addition to any other remedies under the contract the cost of retesting defective materials will be at the Contractor's expense.

1.5 ENVIRONMENTAL CONDITIONS

Unless otherwise recommended by the paint manufacturer, the ambient temperature shall be between 7 and 35 degrees C when applying coatings other than water-thinned, epoxy, and moisture-curing polyurethane coatings. Water-thinned coatings shall be applied only when ambient temperature is between 10 and 32 degrees C. Epoxy, and moisture-curing polyurethane coatings shall be applied only within the minimum and maximum temperatures recommended by the coating manufacturer. Moisture-curing polyurethane shall not be applied when the relative humidity is below 30 percent.

1.6 SAFETY AND HEALTH

Work shall comply with applicable Federal, State, and local laws and regulations, and with the ACCIDENT PREVENTION PLAN, including the Activity Hazard Analysis as specified in the CONTRACT CLAUSES. The Activity Hazard Analysis shall include analyses of the potential impact of painting operations on painting personnel and on others involved in and adjacent to the work zone.

1.6.1 Worker Exposures

Exposure of workers to hazardous chemical substances shall not exceed limits as established by ACGIH-02, or as required by a more stringent applicable regulation.

1.6.2 Toxic Compounds

Toxic products having ineffective physiological warning properties, such as no or low odor or irritation levels, shall not be used unless approved by the Contracting Officer.

1.6.3 Training

Workers having access to an affected work area shall be informed of the contents of the applicable material data safety sheets (MSDS) and shall be informed of potential health and safety hazard and protective controls associated with materials used on the project. An affected work area is one which may receive mists and odors from the painting operations. Workers involved in preparation, painting and clean-up shall be trained in the safe handling and application, and the exposure limit, for each material which the worker will use in the project. Personnel having a need to use respirators and masks shall be instructed in the use and maintenance of such equipment.

1.6.4 Coordination

Work shall be coordinated to minimize exposure of building occupants, other Contractor personnel, and visitors to mists and odors from preparation, painting and clean-up operations.

1.7 SAFETY AND HEALTH

The Contractor shall comply with the safety and health provisions contained herein in addition to those provisions contained in EM 385-1-1. The additional provisions are intended to amplify those contained in EM 385-1-1. The Contractor shall develop all required safety and health plans consistent the following:

1.7.1 SSPC-PA 3, A Guide for Safety in Paint Application

1.7.2 The manufacturer's Material Safety Data Sheets (MSDS). Use impermeable gloves, chemical goggles or faceshield, and other protective clothing and equipment as recommended by the coating manufacturer to prevent exposure to hazardous materials.

1.7.3 29 CFR 1910

1.7.4 Threshold Limit Values (TLV's) as set by the American Conference of Governmental Industrial Hygienists

PART 2 PRODUCTS

2.1 PAINT

The term "paint" as used herein includes emulsions, enamels, paints, stains, varnishes, sealers, cement-emulsion filler, and other coatings, whether used as prime, intermediate, or finish coat. Paint shall conform to the respective specifications listed for use in the painting schedules at the end of this section, except when the required amount of a material of a particular batch is 200 liters or less, an approved first-line proprietary paint material with similar intended formulation, usage and color to that specified may be used. Additional requirements are as follows:

2.1.1 Colors and Tints

Colors shall be as selected from manufacturer's standard colors, as indicated. Manufacturer's standard color is for identification of color only. Tinting of epoxy and urethane paints shall be done by the manufacturer. Stains shall conform in shade to manufacturer's standard color. The color of the undercoats shall vary slightly from the color of the next coat.

2.1.2 Lead

Paints containing lead in excess of 0.06 percent by weight of the total nonvolatile content (calculated as lead metal) shall not be used.

2.1.3 Chromium

Paints containing zinc chromate or strontium chromate pigments shall not be used.

2.1.4 Volatile Organic Compound (VOC) Content

Paints shall comply with applicable federal, state and local laws enacted to insure compliance with Federal Clean Air Standards and shall conform to the restrictions of the local air pollution control authority.

PART 3 EXECUTION

3.1 PROTECTION OF AREAS NOT TO BE PAINTED

Items not to be painted which are in contact with or adjacent to painted surfaces shall be removed or protected prior to surface preparation and painting operations. Items removed prior to painting shall be replaced when painting is completed. Following completion of painting, workmen skilled in the trades involved shall reinstall removed items. Surfaces contaminated by coating materials shall be restored to original condition.

3.2 SURFACE PREPARATION

Surfaces to be painted shall be clean and free of foreign matter before application of paint or surface treatments. Oil and grease shall be removed prior to mechanical cleaning. Cleaning shall be programmed so that dust and other contaminants will not fall on wet, newly painted surfaces. Exposed ferrous metals such as nail heads on or in contact with surfaces to be painted with water-thinned paints, shall be spot-primed with a suitable corrosion-inhibitive primer capable of preventing flash rusting and compatible with the coating specified for the adjacent areas.

3.2.1 Concrete Surfaces

Concrete surfaces shall be allowed to dry at least 30 days before painting, except concrete slab on grade which shall be allowed to cure 90 days before painting. Surfaces shall be cleaned in accordance with ASTM D 4258. Glaze, efflorescence, laitance, dirt, grease, oil, asphalt, surface deposits of free iron and other foreign matter shall be removed prior to painting. Surfaces to receive polyurethane or epoxy coatings shall be acid-etched or mechanically abraded as specified by the coating manufacturer, rinsed with water, allowed to dry, and treated with the manufacturer's recommended conditioner prior to application of the first coat.

3.2.2 Ferrous Surfaces

Ferrous surfaces including those that have been shop-coated, shall be solvent-cleaned or detergent-washed in accordance with SSPC SP 1. Surfaces that contain loose rust, loose mill scale, and other foreign substances shall be cleaned mechanically with hand tools according to SSPC SP 2 or SP 6, power tools according to SSPC SP 3 or by sandblasting according to SSPC SP 7. Shop-coated ferrous surfaces shall be protected from corrosion by treating and touching up corroded areas immediately upon detection.

3.2.3 Nonferrous Metallic Surfaces

Galvanized, aluminum and aluminum-alloy, lead, copper, and other nonferrous metal surfaces shall be solvent-cleaned or detergent-washed in accordance with SSPC SP 1.

3.2.4 Previously Painted Surfaces

Previously painted surfaces damaged during construction shall be thoroughly cleaned of all grease, dirt, dust or other foreign matter. Blistering, cracking, flaking and peeling or other deteriorated coatings shall be removed. Slick surfaces shall be roughened. Damaged areas such as, but not limited to, nail holes, cracks, chips, and spalls shall be repaired with suitable material to match adjacent undamaged areas. Edges of chipped paint shall be feather edged and sanded smooth. Rusty metal surfaces shall be cleaned as per SSPC requirements. Solvent, mechanical, or chemical cleaning methods shall be used to provide surfaces suitable for painting. Chalk shall be removed so that when tested in accordance with ASTM D 4214, the chalk resistance rating is no less than 8. New, proposed coatings shall be compatible with existing coatings. If existing surfaces are glossy, the gloss shall be reduced.

3.2.5 Painting

3.2.5.1 The term "touch-up painting" refers to the application of paint on small areas of painted surfaces to repair mars, scratches, and small areas where the coating has deteriorated in order to restore the coating to an unbroken condition.

3.2.5.2 Damaged finished surfaces of factory-coated equipment, components, etc., shall be touched-up to match original finish with the same type finish coating as applied at the factory.

3.3 MIXING AND THINNING

When thinning is approved as necessary to suit surface, temperature, weather conditions, or application methods, paints may be thinned in accordance with the manufacturer's directions. When thinning is allowed, paints shall be thinned immediately prior to application with not more than 0.125 L of suitable thinner per liter. The use of thinner shall not relieve the Contractor from obtaining complete hiding, full film thickness, or required gloss. Thinning shall not cause the paint to exceed limits on volatile organic compounds. Paints of different manufacturers shall not be mixed.

3.3.1 Two-Component Systems

Two-component systems shall be mixed in accordance with manufacturer's instructions. Any thinning of the first coat to ensure proper penetration and sealing shall be as recommended by the manufacturer for each type of substrate.

3.4 APPLICATION

Painting practices shall comply with applicable federal, state and local laws enacted to insure compliance with Federal Clean Air Standards. Unless otherwise specified or recommended by the paint manufacturer, paint may be applied by brush, roller, or spray. At the time of application, paint shall show no signs of deterioration. Uniform suspension of pigments shall be maintained during application. Each coat of paint shall be applied so dry film shall be of uniform thickness and free from runs, drops, ridges, waves, pinholes or other voids, laps, brush marks, and variations in color, texture, and finish. Hiding shall be complete. Rollers for applying paints and enamels shall be of a type designed for the coating to be applied and the surface to be coated. Special attention

shall be given to insure that all edges, corners, crevices, welds, and rivets receive a film thickness equal to that of adjacent painted surfaces. Paints, except water-thinned types, shall be applied only to surfaces that are completely free of moisture as determined by sight or touch.

3.4.1 Ventilation

Affected areas shall be ventilated during paint application so that workers exposure to chemical substances shall not exceed limits as established by ACGIH-02, or as required by a more stringent applicable regulation. Interior work zones having a volume of 280 cubic meters or less shall be ventilated at a minimum of 2 air exchanges per hour. Ventilation in larger work zones shall be maintained by means of mechanical exhaust. Solvent vapors shall be exhausted outdoors, away from air intakes and workers. Return air inlets in the work zone shall be temporarily sealed before start of work until the coatings have dried. Where a coat of material has been applied, must be approved by the Contracting Officer before application of the succeeding specified coat; otherwise, no credit for the coat applied shall be given and the Contractor shall then assume responsibility and recoat the work in question. The painting contractor shall furnish the Contracting Officer a report of each coat applied, when completed for inspection and approval to comply with the above.

3.4.2 Respirators

Operators and personnel in the vicinity of operating paint sprayers shall wear respirators.

3.4.3 First Coat

The first coat shall include repeated touching up of suction spots or overall application of primer or sealer to produce uniform color and gloss. Excess sealer shall be wiped off after each application.

3.4.4 Timing

Surfaces that have been cleaned, pretreated, and otherwise prepared for painting shall be given a coat of the specified first coat as soon as practical after such pretreatment has been completed, but prior to any deterioration of the prepared surface. Sufficient time shall elapse between successive coats to permit proper drying. This period shall be modified as necessary to suit weather conditions. Oil-based or oleoresinous solvent-type paints shall be considered dry for recoating when the paint feels firm, does not deform or feel sticky under moderate pressure of the thumb, and the application of another coat of paint does not cause the undercoat to lift or lose adhesion. Manufacturer's instructions for application, curing and drying time between coats of two-component systems shall be followed.

3.4.5 Ferrous-Metal Primer

Primer for ferrous-metal shall be applied to ferrous surfaces to receive paint other than asphalt varnish prior to deterioration of the prepared surface. The semitransparent film applied to some pipes and tubing at the mill is not to be considered a shop coat, but shall be overcoated with the specified ferrous-metal primer prior to application of finish coats.

3.5 PIPE COLOR CODE MARKING

Pipes in exposed areas and in accessible pipe spaces shall be provided with color band and titles adjacent to all valves, except those provided at plumbing fixtures, at not more than 12 meter spacing on straight pipe runs, adjacent to change in direction, and on both sides where pipes pass through walls or floors. Color code marking shall be of the color listed in TABLE I and the size listed in TABLE II. The arrows shall be installed adjacent to each band to indicate the direction of flow in the pipe. The legends shall be printed in upper-case black letters as listed in TABLE I.

Letter sizes shall be as listed in TABLE II. Marking shall be painted or applied using colored, pressure-sensitive adhesive markers of standard manufacture. Paint shall be as specified for insulated and uninsulated piping.

TABLE I. COLOR CODES FOR MARKING PIPE

Material	Band	Letters and Arrow*	Legend
Fire protection water	Red	White	FIRE PR.
Blowoff	Yellow	Black	B. BLOWOFF
Fuel oil	Yellow	Black	FUEL OIL
Steam	Yellow	Black	STM.
Condensate	Yellow	Black	COND.

TABLE II. COLOR CODE MARKING SIZES

Outside Diameter of Pipe Covering (mm)	Width of Color Band (mm)	Arrow Length x Width (mm)	Size of Legend Letters and Numerals (mm)
Less than 38	200	200 x 57	13
38 to 60	200	200 x 57	19
60 to 150	300	200 x 57	31
200 to 225	600	300 x 110	63
Over 250	800	300 x 115	88

3.6 MISCELLANEOUS PAINTING

3.6.1 Lettering

Lettering shall be provided as scheduled on the drawings, shall be Gothic type, and shall be water-type decalcomania, finished with a protective coating of spar varnish. Samples shall be approved before application.

3.7 SURFACES TO BE PAINTED

Surfaces listed in the painting schedules at the end of this section, other than those listed in paragraph SURFACES NOT TO BE PAINTED, shall be painted as scheduled.

3.8 SURFACES NOT TO BE PAINTED

Surfaces in the following areas are not to be painted: exterior concrete, top 38 mm of all inverted 'V' rails and hinged rails, sprinkler heads and fire detection elements. In addition surfaces of hardware, fittings, and other factory finished items shall not be painted.

3.9 CLEANING

Cloths, cotton waste and other debris that might constitute a fire hazard shall be placed in closed metal containers and removed at the end of each day. Upon completion of the work, staging, scaffolding, and containers shall be removed from the site or destroyed in an approved manner. Paint and other deposits on adjacent surfaces shall be removed and the entire job left clean and acceptable.

3.10 PAINTING SCHEDULES

The following painting schedules identify the surfaces to be painted and prescribe the paint to be used and the number of coats of paint to be applied. Contractor options are indicated by -----or----- between optional systems or coats.

EXTERIOR PAINTING SCHEDULE

Surface	First Coat	Second Coat	Third Coat
Concrete, unless otherwise specified.	FS TT-P-19	FS TT-P-19	None
Ferrous metal unless otherwise specified.	SSPC Paint 5	FS TT-P-38	FS TT-P-38
Overhead, roll-up, rolling, & sliding doors, exterior and interior:	Manufacturers standard baked enamel prime coat	Coating material as recommended by door manufacturer	None
Galvanized metal.	FS TT-P-19	FS TT-P-19	FS TT-P-19

INTERIOR PAINTING SCHEDULE

Surface	First Coat	Second Coat	Third Coat
Concrete not requiring a smooth finish, unless otherwise specified	CID A-A-2340 -----or----- CID A-A-2247 -----or----- CID A-A-2248	CID A-A-2246 CID A-A-2247 CID A-A-2248	None None None
Concrete: ceilings and imbed plates unless otherwise. specified	Primer as recommended by FS TT-C-555 manufacturer	FS TT-C-555, Type I	None
Concrete: floors and inside surfaces of all door trenches and also ferrous imbed plates and angles unless other- wise specified	FS TT-S-223	None	None
Ferrous metal unless otherwise specified.	SSPC Paint 25	FS TT-P-38	FS TT-P-38
Ferrous metal in concealed damp spaces or in exposed areas having unpainted adjacent surfaces including but not limited to unexposed surfaces of blast doors	SSPC Paint 26	None	None
Ferrous metal factory-primed mechanical and electrical equipment.	Two coats of paint as recommended by the equipment manufacturer		None

INTERIOR PAINTING SCHEDULE

Surface	First Coat	Second Coat	Third Coat
Galvanized metal:	FS TT-P-19	Two coats of paint to match adjacent areas	
Metal: Convector enclosures, electrical conduit runs, metallic tubing, uninsulated ducts and pipes, pipe hangers, louvers, grilles, and air outlets in areas having painted adjacent surfaces.	Aluminum and ferrous metal: FS TT-P-645	None	None
	Galvanized surface:	CID A-A-2246	CID A-A-2246
	FS TT-P-19	-----or-----	-----
		CID A-A-2247	CID A-A-2247
		-----or-----	-----
		CID A-A-2248	CID A-A-2248
Metal Door Closers 08700	FS TT-P-19	Two coats of Tan Paint as per Section	
	-- End of Section --		

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DIVISION 13 - SPECIAL CONSTRUCTION

SECTION 13080

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SECTION 13080

SEISMIC PROTECTION FOR MECHANICAL, ELECTRICAL EQUIPMENT

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z21.70	(1981) Earthquake Actuated Automatic Gas Shutoff Systems
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AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 36	(1994a) Carbon Structural Steel
ASTM A 53	(1995a) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
ASTM A 153	(1996) Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A 307	(1994) Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength
ASTM A 500	(1993) Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A 563	(1994) Carbon and Alloy Steel Nuts
ASTM A 603	(1988) Zinc-Coated Steel Structural Wire Rope
ASTM A 653	(1995) Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM E 488	(1990) Strength of Anchors in Concrete and Masonry Elements
ASTM E 580	(1991) Application of Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels in Areas Requiring Seismic Restraint

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B18.2.1 (1981; Supple 1991; R 1992) Square and Hex Bolts and Screws (Inch Series)

ASME B18.2.2 (1987; R 1993) Square and Hex Nuts (Inch Series)

INTERNATIONAL CONFERENCE OF BUILDING OFFICIALS (ICBO)

ICBO-099S94 (1994) Uniform Building Code

SHEET METAL & AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)

SMACNA-12 (1991; Appx E, 1993) Seismic Restraint Manual Guidelines for Mechanical Systems

UNDERWRITERS LABORATORIES (UL)

UL 1570 (1995) Fluorescent Lighting Fixtures

UL 1571 (1995) Incandescent Lighting Fixtures

1.2 SYSTEM DESCRIPTION

1.2.1 General

The requirements for seismic protection measures described in this section shall be applied to mechanical/electrical equipment and systems specified herein. Seismic protection requirements shall be in accordance with ICBO-099S94 using an importance factor of III and shall be provided in addition to any other requirements called for in other sections of these specifications. This facility shall be designed as being in seismic zone III; no other zone values shall be used to establish bracing requirements. Lateral support against earthquake induced forces shall be accomplished by positive attachments without consideration of friction resulting from gravity loads.

1.2.2 Mechanical/Electrical Equipment

Mechanical/electrical equipment shall include the following items to the extent required on the drawings or in other sections of these specifications:

Storage Tanks for Water	Steam, and Water, Oil and Gas Piping
Cable Trays	Exhaust and Return Fans
Control Panels	Air Handling Units
Pumps with Motors	Switchgear
Light Fixtures	Unit Substations
Motor Control Centers	Transformers
Switchboards (Floor Mounted)	Storage Racks
Suspended Ceiling Assemblies	Ducts
Flash Tanks	Unit Heaters

1.2.3 Mechanical/Electrical Systems

The following mechanical and electrical systems shall be installed as required on the drawings and other sections of these specifications and shall be seismically protected in accordance with this specification:

All Piping Inside the Building in Accordance With This Specification
Outside Heat Distribution, Return, and Condensate Systems
Condenser Water Piping Outside the Building

1.2.4 Exclusion

Seismic protection of piping for fire protection systems shall be installed as specified in Sections 15330 WET PIPE SPRINKLER SYSTEM, FIRE PROTECTION,

1.2.5 Pipes and Ducts Requiring No Special Seismic Restraints

Seismic restraints may be omitted from the following installations:

- a. All other piping less than 38 mm (1-1/2 inches) inside diameter.
- b. Electrical conduit less than 64 mm (2-1/2 inches) inside diameter.
- c. Rectangular air handling ducts less than 0.37 square meters (4 square feet) in cross sectional area.
- d. Round air handling ducts less than 457 mm (18 inches) in diameter.
- e. Piping suspended by individual hangers 300 mm or less in length from the top of pipe to the bottom of the supporting structural member where the hanger is attached, except as noted below.
- f. Ducts suspended by hangers 300 mm or less in length from the top of the duct to the bottom of the supporting structural member, except as noted below.

In exemptions e. and f. all hangers shall meet the length requirements. If the length requirement is exceeded by one hanger in the run, the entire run shall be braced.

1.2.6 All Other Interior Piping, Conduit, and Ducts

Interior piping, conduit, and ducts not covered by paragraphs Exclusion or Pipes and Ducts Requiring No special Seismic Restraints shall be seismically protected in accordance with the provisions herein.

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL PROCEDURES:

SD-01 Data

Lighting Fixtures in Buildings; FIO. Miscellaneous Equipment; FIO.

Copies of the design calculations with the detail drawings. Calculations shall be stamped by a registered engineer and shall verify the capability of structural members to which bracing is attached for carrying the load from the brace.

SD-04 Drawings

Bracing and Coupling; FIO. Flexible Couplings or Joints; FIO. Resilient Vibration Isolation Devices; FIO. Bridge Cranes and Monorails; FIO. Lighting Fixtures in Buildings; FIO. Miscellaneous Equipment; FIO.

Detail drawings along with catalog cuts, templates, and erection and installation details, as appropriate, for the items listed. Submittals shall be complete in detail; shall indicate thickness, type, grade, class of metal, and dimensions; and shall show construction details, reinforcement, anchorage, and installation with relation to the building construction.

SD-13 Certificates

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

Materials and equipment shall conform to the requirements specified below:

2.1.1 Bolts and Nuts

Squarehead and hexhead bolts, and heavy hexagon nuts, ASME B18.2.1, ASME B18.2.2, or ASTM A 307 for bolts and ASTM A 563 for nuts. Bolts and nuts used underground and/or exposed to weather shall be galvanized in accordance with ASTM A 153.

2.1.2 Sway Bracing

Material used for members listed in this section, shall be structural steel conforming with the following:

- a. Plates, rods, and rolled shapes, ASTM A 36.
- b. Wire rope, ASTM A 603.
- c. Tubes, ASTM A 500, Grade B.
- d. Pipes, ASTM A 53, Type E or S, Grade B.
- e. Light gauge angles, less than 6 mm thickness, ASTM A 653 .

2.1.3 Lighting Fixture Supports

Fixture supports shall be malleable iron. Lighting fixtures and supports shall conform to UL 1570 or UL 1571 as applicable.

PART 3 EXECUTION

3.1 BRACING AND COUPLING

Sway braces shall be installed on piping, conduit, and duct to preclude damage during seismic activity. Provisions of this paragraph apply to all piping within a 1.5 m line around outside of building unless buried in the ground. Piping grouped for support on trapeze-type hangers shall be braced at the same intervals as determined by the smallest diameter pipe of the group. No trapeze-type hanger shall be secured with less than two 13 mm

(1/2 inch) bolts. Bracing rigidly attached to pipe flanges, or similar, shall not be used where it would interfere with thermal expansion of piping.

3.2 FLEXIBLE COUPLINGS OR JOINTS

3.2.1 Building Piping

Flexible couplings or joints in building piping shall be provided at bottom of all pipe risers larger than 90 mm (3-1/2 inches) in diameter. Flexible couplings or joints shall be braced laterally without interfering with the action of the flexible coupling or joint. Cast iron waste and vent piping need only comply with these provisions when caulked joints are used. Flexible bell and spigot pipe joints using rubber gaskets or no-hub fittings may be used at each branch adjacent to tees and elbows for underground waste piping inside of building to comply with these requirements.

3.2.2 Underground Piping

Underground piping and 100 mm (4 inch) or larger conduit, except heat distribution system, shall have flexible couplings installed where the piping enters the building. The couplings shall accommodate 76 mm of relative movement between the pipe and the building in any direction. Additional flexible couplings shall be provided where shown on the drawings.

3.3 PIPE SLEEVES

Pipe sleeves in interior non-fire rated walls shall be sized as indicated in the appropriate specification section to provide clearances that will permit differential movement of piping without the piping striking the pipe sleeve.

3.4 SPREADERS

Spreaders shall be provided between adjacent piping runs to prevent contact during seismic activity whenever pipe or insulated pipe surfaces are less than 100 mm apart. Spreaders shall be applied at same interval as sway braces at an equal distance between the sway braces. If rack type hangers are used where the pipes are restrained from contact by mounting to the rack, spreaders are not required for pipes mounted in the rack. Spreaders shall be applied to surface of bare pipe and over insulation on insulated pipes utilizing high-density inserts and pipe protection shields in accordance with the requirements of Section 15250 THERMAL INSULATION FOR MECHANICAL SYSTEMS.

3.5 ANCHOR BOLTS

3.5.1 Cast-In-Place

Floor or pad mounted equipment shall use cast-in-place anchor bolts, except as specified below. One nut shall be provided on each bolt. Anchor bolts shall conform to the following tabulation for the various equipment weights and specified seismic zone or the manufacturer's installation recommendations, whichever is the most stringent, unless otherwise shown on the drawings. Anchor bolts that exceed the normal depth of equipment foundation piers or pads shall either extend into concrete floor or the foundation shall be increased in depth to accommodate bolt lengths.

3.5.2 Minimum Bolt Sizes, Cast-In-Place Anchor Bolts

Max. Equip. Weight Kg	Zone 3	Minimum Bolt Sizes (mm)*
225	13	
450		13
2250		13
4500		13
9000		13
13500		13
22500		16
45000		**

*Based on four bolts per item, a minimum embedment of 12 bolt diameters, a minimum bolt spacing of 16 bolt diameters and a minimum edge distance of 12 bolt diameters. Equivalent total cross-sectional area shall be used when more than four bolts per item are provided. Anchor bolts shall conform to ASTM A 307. Anchor bolts shall have an embedded straight length equal to at least 12 times nominal diameter of the bolt.

**Equipment weighing more than 22,500 kg in Zones 3 and 4 shall have at least six bolts per item.

3.5.3 Expansion or Chemically Bonded Anchors

Expansion or chemically bonded anchors shall not be used unless test data in accordance with ASTM E 488 has been provided to verify the adequacy of the specific anchor and application. The expansion anchor size shall be not less than that required in paragraph Minimum Bolt Sizes, Cast-In-Place Anchor Bolts. Expansion and chemically bonded anchors shall be installed in accordance with the manufacturer's recommendations. The allowable forces shall be adjusted for the spacing between anchor bolts and the distance between the anchor bolt and the nearest edge, as specified by the manufacturer.

3.5.3.1 General Testing

Expansion and chemically bonded anchors shall be tested in place after installation. The tests shall occur not more than 24 hours after installation of the anchor and shall be conducted by an independent testing agency; testing shall be performed on random anchor bolts as described below.

3.5.3.2 Torque Wrench Testing

Torque wrench testing shall be done on not less than 50 percent of the total installed expansion anchors and at least one anchor for every piece of equipment containing more than two anchors. The test torque shall equal the minimum required installation torque as required by the bolt manufacturer. Torque wrenches shall be calibrated at the beginning of each day the torque tests are performed. Torque wrenches shall be recalibrated for each bolt diameter whenever tests are run on bolts of various diameters. The applied torque shall be between 20 and 100 percent of wrench capacity. The test torque shall be reached within one half turn of the nut, except for 9 mm sleeve anchors which shall reach their torque by

one quarter turn of the nut. If any anchor fails the test, similar anchors not previously tested shall be tested until 20 consecutive anchors pass. Failed anchors shall be retightened and retested to the specified torque; if the anchor still fails the test it shall be replaced.

3.5.3.3 Pullout Testing

Expansion and chemically bonded anchors shall be tested by applying a pullout load using a hydraulic ram attached to the anchor bolt. At least 5 percent of the anchors, but not less than three per day shall be tested. The load shall be applied to the anchor without removing the nut; when that is not possible, the nut shall be removed and a threaded coupler shall be installed of the same tightness as the original nut. The test setup shall be checked to verify that the anchor is not restrained from withdrawing by the baseplate, the test fixture, or any other fixtures. The support for the testing apparatus shall be at least 1.5 times the embedment length away from the bolt being tested. Each tested anchor shall be loaded to 1 times the design tension value for the anchor. The anchor shall have no observable movement at the test load. If any anchor fails the test, similar anchors not previously tested shall be tested until 20 consecutive anchors pass. Failed anchors shall be retightened and retested to the specified load; if the anchor still fails the test it shall be replaced.

3.6 RESILIENT VIBRATION ISOLATION DEVICES

Selection of anchor bolts for vibration isolation devices and/or snubbers for equipment base and foundations shall follow the same procedure as in paragraph ANCHOR BOLTS except that an equipment weight equal to five times the actual equipment weight shall be used.

3.6.1 Resilient and Spring-Type Vibration Devices

Vibration isolation devices shall be selected so that the maximum movement of equipment from the static deflection point shall be 15 mm.

3.6.2 Multidirectional Seismic Snubbers

Multidirectional seismic snubbers employing elastomeric pads shall be installed on all floor- or slab-mounted equipment. These snubbers shall provide 6 mm free vertical and horizontal movement from the static deflection point. Snubber medium shall consist of multiple pads of cotton duct and neoprene or other suitable materials arranged around a flanged steel trunnion so both horizontal and vertical forces are resisted by the snubber medium.

3.7 SWAY BRACES FOR PIPING

Sway braces shall be provided to prevent movement of the pipes under seismic loading. Braces shall be provided in both the longitudinal and transverse directions, relative to the axis of the pipe. The bracing shall not interfere with thermal expansion requirements for the pipes as described in other sections of these specifications.

3.7.1 Transverse Sway Bracing

Transverse sway bracing for steel pipe shall be provided at intervals not to exceed those given in the tabulation below as modified for each seismic zone. All runs shall have a minimum of two transverse braces.

3.7.2 Longitudinal Sway Bracing

Longitudinal sway bracing shall be provided at 12 m intervals except when the location of sway braces is shown on the drawings for the particular piping system. All runs shall have one longitudinal brace minimum. Sway braces shall be constructed in accordance with the drawings. Branch lines, walls, or floors shall not be used as sway braces.

3.7.3 Vertical Runs

Vertical runs of piping shall be braced at not more than 3 m vertical intervals. For tubing, bracing shall be provided at no more than 1.2 m spacing. Vertical braces shall be above the center of gravity of the span being braced. All sway braces shall be constructed in accordance with the drawings. Branch lines, walls, or floors shall not be used as sway braces.

3.7.4 Anchor Rods, Angles, and Bars

Anchor rods, angles, and bars shall be bolted to either pipe clamps or pipe flanges at one end and cast-in-place concrete or masonry insert or clip angles bolted to the steel structure on the other end. Rods shall be solid metal or pipe as specified below. Anchor rods, angles, and bars shall not exceed lengths given in the tabulation below.

3.7.5 Maximum Length for Anchor Braces

Type (kilonewtons)	Size (millimeters)	Maximum length* (meters)	Allowable Loads*
Angles	38 x 38 x 6	1.5	25.5
	50 x 50 x 6	2.0	34.5
	64 x 38 x 6	2.5	43.5
	75 x 64 x 6	2.5	48.0
	75 x 75 x 6	3.0	53.0
Rods	91	1.0	16.5
	22	1.0	22.0
Flat Bars	38 x 6	0.4	14.0
	50 x 6	0.4	18.0
	50 x 10	0.5	28.5
Pipes (40s)	25	2.0	18.0
	32	2.8	24.5
	40	3.2	29.5
	50	4.0	39.5

*Based on the slenderness ratio of $l/r = 200$ and ASTM A 36 steel, where l is the length of the brace and r is the least radius of gyration of the brace.

3.7.6 Clamps and Hangers

Clamps or hangers on uninsulated pipes shall be applied directly to pipe. Insulated piping shall have clamps or hangers applied over insulation in accordance with Section 15250 THERMAL INSULATION FOR MECHANICAL SYSTEMS.

3.7.7 Bolts

Bolts used for attachment of anchors to pipe and structure shall be not less than 13 mm (1/2 inch) diameter.

3.8 SWAY BRACES FOR DUCTS

3.8.1 Braced Ducts

Bracing details and spacing for rectangular and round ducts shall be in accordance with SMACNA-12, including Appendix E, using Seismic Hazard Level 3 and connection level B.

3.8.2 Unbraced Ducts

Hangers for unbraced ducts shall be positively attached to the duct within 50 mm of the top of the duct with a minimum of two #10 sheet metal screws. Unbraced ducts shall be installed with a 150 mm minimum clearance to vertical ceiling hanger wires.

3.9 SWAY BRACES FOR CONDUIT

Conduit shall be braced as for an equivalent weight pipe.

3.10 EQUIPMENT SWAY BRACING

3.10.1 Floor or Pad Mounted Equipment

3.10.1.1 Shear Resistance

Floor mounted equipment shall be bolted to the floor. Requirements for the number and installation of bolts to resist shear forces shall be in accordance with paragraph ANCHOR BOLTS.

3.10.1.2 Overturning Resistance

The ratio of the height of the equipment (measured from the base to the center of gravity of the equipment) to the minimum distance between anchor bolts shall be used to determine if overturning forces need to be considered in the sizing of anchor bolts. If this ratio is greater than 2.22 the bolt values in paragraph Minimum Bolt Sizes, Cast-In-Place Anchor Bolts shall not be used and calculations shall be provided to verify the adequacy of the anchor bolts for combined shear and overturning.

3.11 MISCELLANEOUS EQUIPMENT

3.11.1 Rigidly Mounted Equipment

The following specific items of equipment to be furnished under this contract shall be constructed and assembled to withstand a horizontal lateral force of 0.23 times the operating weight of the equipment, at vertical center of gravity of the equipment without causing permanent deformation, dislocations, separation of components, or other damage, which would render the equipment inoperative for significant periods of time

following an earthquake.

Rigidly Mounted Equipment

Air-Handling Units

Substations
Transformers
Switch Boards and Switch Gears
Motor Control Centers
Free Standing Electric Motors

3.11.2 Nonrigid or Flexibly-Mounted Equipment

The following specific items of equipment to be furnished shall be constructed and assembled to resist a horizontal lateral force of 1.5 times the operating weight of the equipment at the vertical center of gravity of the equipment.

3.12 LIGHTING FIXTURES IN BUILDINGS

Lighting fixtures and supports shall conform to the following:

3.12.1 Pendant Fixtures

Loop and hook or swivel hanger assemblies for pendant fixtures shall be fitted with a restraining device to hold the stem in the support position during earthquake motions. Pendant-supported fluorescent fixtures shall also be provided with a flexible hanger device at the attachment to the fixture channel to preclude breaking of the support. The motion of swivels or hinged joints shall not cause sharp bends in conductors or damage to insulation.

3.12.2 Assembly Mounted on Outlet Box

A supporting assembly that is intended to be mounted on an outlet box shall be designed to accommodate mounting features on 100 mm boxes, 75 mm plaster rings, and fixture studs.

3.12.3 Surface-Mounted Fluorescent Fixtures

Surface-mounted fluorescent individual or continuous-row fixtures shall be attached to a seismic-resistant ceiling support system. Fixture support devices for attaching to suspended ceilings shall be a locking-type scissor clamp or a full loop band that will securely attach to the ceiling support. Fixtures attached to underside of a structural slab shall be properly anchored to the slab at each corner of the fixture.

3.12.4 Wall-Mounted Emergency Light Unit

Each wall-mounted emergency light unit shall be secured to remain in place during a seismic disturbance.

3.12.5 Lateral Force

Light fixture bracing shall be designed to resist a lateral force of 1.13

times the fixture weight.

-- End of Section --

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SECTION 13814

BUILDING PREPARATION FOR ENERGY MONITORING AND CONTROL SYSTEMS (EMCS)

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI C12.1 (1988) Code for Electricity Metering

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME-18 (1971; Int. Supple 19.5-1972; Errata 1974)
Fluid Meters, Their Theory and Application

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C57.13 (1993) Instrument Transformers

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250 (1991) Enclosures for Electrical Equipment
(1000 Volts Maximum)

NEMA ICS 1 (1993) Industrial Controls and Systems

1.2 GENERAL REQUIREMENTS

1.2.1 Preparation of Building for Interface

The Contractor shall provide all services, materials, and equipment necessary to prepare the building for interface to the existing EMCS.

1.2.2 Environmental Conditions

All equipment shall be rated for continuous operation under the ambient environmental temperature, pressure, humidity, and vibration conditions specified or normally encountered at the installed location.

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL PROCEDURES:

SD-01 Data

Equipment and Performance; FIO.

Six copies of the hardware and maintenance data, in manual format, bound in hardback, loose-leaf binders, within 30 days after completing the site testing. The contents of each manual shall be identified on the cover. The manuals shall include the names, addresses, and telephone numbers of each subcontractor installing equipment and systems, and of the nearest service representatives for each item of equipment and each system. The manuals shall have a table of contents and tab sheets. Tab sheets shall be placed at the beginning of each chapter or section and at the beginning of each appendix. The final copies, to be submitted after completion of the site test, shall include all modifications made during installation, checkout, and acceptance.

Hardware data, shall describe all equipment provided, including:

- a. General description and specifications.
- b. Installation and checkout procedures.
- c. Electrical schematics and layout drawings.
- d. Alignment and calibration procedures.
- e. Manufacturer's repair parts list indicating sources of supply, and National Stock Number when obtainable from the manufacturer.
- f. Interface definition.

The maintenance data, shall include descriptions of maintenance for all equipment including inspection, periodic preventive maintenance, fault diagnosis, and repair or replacement of defective components.

SD-04 Drawings

Equipment and Material; FIO.

Detail drawings consisting of a complete list of equipment and material, including manufacturer's descriptive and technical literature, performance charts and curves, catalog cuts, and installation instructions. Drawings shall contain complete wiring, routing, and schematic diagrams. Drawings shall show proposed layout and installation of all equipment and appurtenances, and equipment relationship to other parts of the work including clearances for maintenance and operation.

SD-08 Statements

Test Plan; FIO.

Six Copies of test plan and test procedure. Six Copies of test report that documents the test results, in booklet form. Test plan documents for the test, 120 days prior to the test. The test plan shall define all the tests required to ensure that the equipment meets technical and performance specifications. The test plan shall define milestones for the test exercises and shall identify the capabilities and functions to be tested.

Test Procedure; FIO.

Test procedure documents, 60 days prior to the test. Test procedures shall be developed from the test plans and design documentation. The procedures shall consist of detailed instructions for test setup, execution, and

evaluation of test results. The procedures shall explain and shall detail, step by step, actions and expected results to demonstrate the requirements of this specification and the methods for simulating the necessary conditions of operation to demonstrate performance of the equipment. All test equipment to be used shall be furnished by the Contractor.

SD-09 Reports

Site Testing; FIO.

Test report, within 15 days after completion of the test. The test report shall be used to document results of the test.

PART 2 PRODUCTS

2.1 STANDARD PRODUCTS

Materials and equipment shall be standard products of a manufacturer regularly engaged in the manufacture of such products. Units of the same type of equipment shall be products of a single manufacturer.

2.2 ENCLOSURES

Enclosures shall conform to the requirements of NEMA 250 for the types specified. Finish color shall be the manufacturer's standard, unless otherwise indicated. Damaged surfaces shall be repaired and refinished using original type finish. Enclosures installed indoors shall be Type 12, or as shown. Equipment installed outdoors shall be housed in a Type 4 enclosure, unless otherwise shown.

2.3 NAMEPLATES

Laminated plastic nameplates shall be provided for all equipment furnished. Each nameplate shall identify the function, such as "mixed air controller" or "cold deck temperature sensor." Laminated plastic shall be 3 mm thick, white with black center core. Nameplates shall be a minimum of 25 by 75 mm, with minimum 6 mm high engraved block lettering. Nameplates for devices smaller than 25 by 75 mm shall be attached by a nonferrous metal chain. All other nameplates shall be attached to the equipment.

2.4 INSTRUMENTATION AND CONTROL (I&C) DIAGRAMS

Framed mylar drawings in laminated plastic shall be provided. Drawings shall show complete I&C diagrams for all equipment furnished and interfaces to all existing equipment, at each respective equipment location. Condensed operating instructions explaining preventive maintenance procedures, methods of checking the system for normal safe operation, and procedures for safely starting and stopping the system manually shall be prepared in typed form, framed as specified for the I&C diagrams and posted beside the diagrams. Proposed diagrams, instructions, and other sheets shall be submitted prior to posting. The instructions shall be posted after completion of the Contractor's site testing. Provide a mylar reproducible of each I&C diagram in addition to the posted copy.

2.5 DATA TERMINAL CABINET (DTC)

Data terminal cabinet shall be provided for each mechanical room as an interface to the data environment (DE) instrumentation and controls. No instrumentation and control devices shall be located within the DTC.

2.5.1 Enclosure

The DTC shall be a separate metallic enclosure. The DTC shall be sized to accommodate the number of functions required by the control and monitoring devices as shown plus 25 percent expansion for each type of function provided.

2.5.2 Groupings

The DTC shall be divided into analog and digital groupings, each with separate sensor and control signal wiring raceways.

2.5.3 Terminal Strips

The DTC shall be provided with double sided screw type terminal strips. One side of the terminal strip shall be used for termination of field wiring from instrumentation and controls. The other side shall be used to connect the DTC to the [future] [existing] FID or MUX. Terminal strips shall have individual terminal identification numbers.

2.5.4 Power

A 120-Vac, 15-A, 60 Hz duplex outlet shall be provided within 1.8 m of each DTC.

2.6 INSTRUMENTATION AND CONTROL

2.6.1 Temperature Instruments

2.6.1.1 Resistor Temperature Detector (RTD)

RTDs shall be platinum with an accuracy of plus or minus 0.1 percent at 0.0 degrees C (32 degrees F) and shall be encapsulated in epoxy, series 300 stainless steel, anodized aluminum, or copper. Each RTD shall be furnished with an RTD transmitter specified and mounted integrally, unless otherwise shown.

2.6.1.2 Resistor Temperature Detector (RTD) Transmitters

The RTD transmitter shall be selected to match the resistance range of the platinum RTD. The transmitter shall produce a linear 4 to 20 mA_{dc} output corresponding to the required temperature span. The output error shall not exceed 0.1 percent of calibrated span. The transmitter shall include offset and span adjustments unless the RTD element is integral to the transmitter and system calibration is provided.

2.6.1.3 Continuous Averaging RTDs

Continuous averaging RTDs shall have an accuracy of plus or minus 0.6 degree C at the reference temperature, and shall be of sufficient length to ensure that the resistance represents an average over the cross section in which it is installed. The sensor shall have a bendable copper sheath. Each averaging RTD shall be furnished with an RTD transmitter selected to match the resistance range of the averaging RTD. The transmitter shall produce a linear 4 to 20 mA_{dc} output corresponding to the required temperature span. The output error of the transmitter shall not exceed 0.1 percent of the calibrated span. The transmitter shall include offset and span adjustments.

2.6.1.4 Temperature Switches

Temperature switches shall have a repetitive accuracy of plus or minus 1 percent of the operating ranges shown. Switch actuation shall be adjustable over the operating temperature range. The switch shall have a snap-action Form C contact rated for the application.

2.6.2 Electric Power Instruments

2.6.3 Output Devices

2.6.3.1 Control Relays

Control relay contacts shall be rated for the application, with a minimum of 2 sets of Form C contacts enclosed in a dust-proof enclosure. Relays shall be rated for a minimum life of one million mechanical operations. Operating time shall be 20 milliseconds or less, with release time of 10 milliseconds or less. Relays shall be equipped with coil transient suppression devices to limit transients to 150 percent of rated coil voltage.

2.6.3.2 Contactors

Contactors shall be of the single coil, electrically operated, mechanically held type. Positive locking shall be obtained without the use of hooks, latches, or semipermanent magnets. Contacts shall be double-break silver-to-silver type protected by arcing contacts where necessary. Number of contacts and ratings shall be selected for the application. Operating and release times shall be 100 milliseconds or less. Contactors shall be equipped with coil transient suppression devices to limit transients to 150 percent of rated coil voltage.

2.6.3.3 Solid State Relays

Input-output isolation shall be greater than 1000 megohms with a breakdown voltage of 1500 volts root mean square or greater at 60 Hz. Relays shall be rated for a minimum life of 10 million operations. The ambient temperature range shall be at least minus 28.9 degrees C to plus 60.0 degrees C (minus 20 to plus 140 degrees F). Input impedance shall not be less than 500 ohms. Relays shall be rated for the application. Operating and release times shall be 1 millisecond or less. Transients shall be limited to 150 percent of control voltage. Solid state relays shall not be used on inductive loads which are switched on-off.

2.6.3.4 Single Input Control Point Adjustment (CPA) Controller

Single input CPA controllers shall permit changing of control points remotely by varying the CPA port value. CPA shall be plus or minus 10 percent of primary sensor span. Controllers shall operate from electronic or pneumatic sensors as shown. Controllers shall be complete with adjustable setpoint, adjustable gain (proportional band), and shall be field selectable for direct or reverse action. Pneumatic units provided shall be constructed to withstand a maximum pressure of 172 kPa. All controller inputs and outputs shall be provided with internal or external gauges or meters for calibration of input and output signals.

2.6.3.5 Dual Input Controller

Dual input controllers shall permit changing of control points remotely by varying the second port input value. Controllers shall operate from electronic or pneumatic sensors as shown. Controllers shall be complete with adjustable setpoint, adjustable gain (proportional band), adjustable authority, and shall be field selectable for direct or reverse action. Authority effect of secondary sensor on setpoint shall be adjustable from 33 to 100 percent of primary sensor span. Pneumatic units provided shall be constructed to withstand a maximum pressure of 172 kPa. All controller inputs and outputs shall be provided with internal or external gauges or meters for calibration of input and output signals.

2.6.3.6 WIRE AND CABLE

The Contractor shall provide all wire and cable from the sensors and control devices in the DE to the DTCs.

2.6.3.6.1 Control Wiring

2.7 Digital Functions

Control wiring for digital functions shall be No. 18 AWG minimum with 600-volt insulation. Multiconductor wire shall have an outer jacket of Polyvinyl Chloride (PVC).

2.8 Analog Functions

Control wiring for analog functions shall be No. 18 AWG minimum with 600-volt insulation, twisted and shielded, 2-, 3-, or 4-wire to match analog function hardware. Multiconductor wire shall have an outer jacket of PVC.

2.9 Sensor Wiring

Sensor wiring shall be No. 20 AWG minimum twisted and shielded, 2-, 3-, 4-wire to match analog function hardware. Multiconductor wire shall have an outer jacket of PVC.

2.10 Class 2 Low Energy Conductors

The conductor types and sizes specified for digital and analog functions shall take precedence over any requirements for Class 2 low energy remote control and signal circuit conductors specified elsewhere.

2.11 RACEWAY SYSTEMS

Raceway systems from the sensors and control devices in the DE to the DTCs shall be provided by the Contractor.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

The Contractor shall install all components and appurtenances in accordance with the manufacturer's instructions and as shown or specified. All necessary interconnections, services, and adjustments required to prepare the building for interface to an EMCS shall be furnished. All wiring, including low voltage wiring, shall be installed in metallic raceways. Instrumentation grounding as necessary to preclude ground loops and noise from adversely affecting equipment operations shall be installed.

3.2 I/O SUMMARY TABLES

I/O Summary Tables shall be used in conjunction with the drawings to identify the hardware required for each building and system.

3.3 EQUIPMENT INSTALLATION

3.3.1 Temperature Instruments

3.3.1.1 Resistor Temperature Detector (RTD)

When the RTD is installed in pipes or is susceptible to corrosion and vibration, the RTD shall be installed in a thermowell. RTDs which are attached to surfaces shall be clamped or bonded in place. The surface shall be thoroughly cleaned, degreased, and after RTD installation, shall be insulated from ambient temperature effects. RTDs used for space temperature sensing shall include a housing suitable for wall mounting. RTDs used for OA sensing shall have an instrument shelter to minimize solar effects, and shall be mounted to minimize building effects. RTD assemblies shall be readily accessible and installed in a manner as to allow easy replacement.

3.3.1.2 Temperature Switches

Temperature switches shall be installed as specified for RTDs. Temperature switches shall be adjusted to the proper setpoint and shall be verified by calibration. Switch contact ratings and duty shall be selected in accordance with NEMA ICS 1.

3.3.2 Instrument Shelters

Instrument shelters shall be installed with the bottom 1.2 m above the supporting surface, using legs, and secured rigidly to minimize vibrations from winds. Instrument shelters shall be oriented facing north.

3.3.3 Enclosures

All enclosure penetrations shall be from the bottom and shall be sealed to preclude entry of water using a silicone rubber sealant.

3.4 SITE TESTING

Site testing and adjustment of all equipment shall be performed in accordance with approved test procedures. The Contractor shall provide all personnel, equipment, instrumentation, and supplies necessary to perform all site testing. Test reports shall be submitted as specified.

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SECTION 13977

BLAST RESISTANT DOORS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN BEARING MANUFACTURERS ASSOCIATION (ABEMA)

- | | |
|----------|----------------------------------------------------------|
| ABEMA 9 | (1990) Load Ratings and Fatigue Life for Ball Bearings |
| ABEMA 11 | (1990) Load Ratings and Fatigue Life for Roller Bearings |

AMERICAN CONCRETE INSTITUTE (ACI)

- | | |
|--------------|-----------------------------------------------------------------------------|
| ACI 318/318R | (1989; Rev 1992; Errata) Building Code Requirements for Reinforced Concrete |
|--------------|-----------------------------------------------------------------------------|

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

- | | |
|---------|----------------------------------------------------------------------------------------------------|
| AISC-01 | (1993) Load & Resistance Factor Design Manual Vol 1 - Structural Members, Specifications and Codes |
| AISC-02 | (1993) Load & Resistance Factor Design Manual Vol II - Connections |
| AISC-03 | (1989) Manual of Steel Construction Allowable Stress Design |
| AISC-04 | (1989) Specification for Structural Steel Buildings - Allowable Stress Design and Plastic Design |

AMERICAN IRON AND STEEL INSTITUTE (AISI)

- | | |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AISI SG-671 | (1986; Addenda 1989; Errata Nov, 1990) Specification for the Design of Cold-Formed Steel Structural Members (Part I of the Cold-Formed Steel Design Manual) |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- | | |
|------------|-----------------------------------------------------------------------|
| ASTM A 36 | (1994) Carbon Structural Steel |
| ASTM A 123 | (1989a) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products |
| ASTM A 153 | (1982; R 1987) Zinc Coating (Hot-Dip) on Iron and Steel Hardware |

ASTM A 242	(1993a) High-Strength Low-Alloy Structural Steel
ASTM A 307	(1994) Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
ASTM A 325	(1994) Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
ASTM A 354	(1994) Quenched and Tempered Alloy Steel Bolts, Studs, and Other Externally Threaded Fasteners
ASTM A 366	(1991; R 1993) Steel, Sheet, Carbon, Cold-Rolled, Commercial Quality
ASTM A 446	(1993) Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality
ASTM A 449	(1993) Quenched and Tempered Steel Bolts and Studs
ASTM A 490	(1993) Heat-Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength
ASTM A 500	(1993) Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A 501	(1993) Hot-Formed Welded and Seamless Carbon Steel Structural Tubing
ASTM A 514	(1994a) High-Yield-Strength, Quenched and Tempered Alloy Steel Plate, Suitable for Welding
ASTM A 526	(1990) Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Commercial Quality
ASTM A 529	(1994) High-Strength Carbon-Manganese Steel of Structural Quality
ASTM A 534	(1994) Carburizing Steels for Anti-Friction Bearings
ASTM A 563	(1994) Carbon and Alloy Steel Nuts
ASTM A 570	(1992; R 1993) Steel, Sheet and Strip, Carbon, Hot-Rolled, Structural Quality
ASTM A 572	(1994b) High-Strength Low-Alloy Columbium-Vanadium Structural Steel
ASTM A 574	(1992a) Alloy Steel Socket-Head Cap Screws
ASTM A 588	(1994) High-Strength Low-Alloy Structural

	Steel with 50 ksi (345 MPa) Minimum Yield Point to 4 in. (100 mm) Thick
ASTM A 606	(1991a; R 1993) Steel, Sheet and Strip, High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, with Improved Atmospheric Corrosion Resistance
ASTM A 607	(1992a) Steel, Sheet and Strip, High-Strength, Low-Alloy, Columbium or Vanadium, or Both, Hot-Rolled and Cold-Rolled
ASTM A 611	(1994) Steel, Sheet, Carbon, Cold-Rolled, Structural Quality
ASTM A 615	(1994) Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM A 618	(1993) Hot-Formed Welded and Seamless High-Strength Low-Alloy Structural Tubing
ASTM A 687	(1993) High-Strength Nonheaded Steel Bolts and Studs
ASTM A 706	(1993a) Low-Alloy Steel Deformed Bars for Concrete Reinforcement
ASTM A 715	(1992a; R 1993) Steel Sheet and Strip, High-Strength, Low-Alloy, Hot-Rolled, and Steel Sheet, Cold-Rolled, High-Strength, Low-Alloy, with Improved Formability
ASTM A 780	(1993a) Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM A 792	(1993a) Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process, General Requirements
ASTM E 90	(1990) Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions
ASTM E 152	(1981a) Fire Tests of Door Assemblies
ASTM E 283	(1991) Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
ASTM F 436	(1993) Hardened Steel Washers
ASTM F 568	(1993a) Carbon and Alloy Steel Externally Threaded Metric Fasteners
ASTM F 835	(1993) Alloy Steel Socket Button and Flat Countersunk Head Cap Screws

ASTM F 883 (1990) Padlocks

AMERICAN WELDING SOCIETY (AWS)

AWS A2.4 (1993) Standard Symbols for Welding, Brazing and Nondestructive Examination

AWS A5.4 (1992) Stainless Steel Electrodes for Shielded Metal Arc Welding

AWS D1.1 (1994) Structural Welding Code - Steel

AWS D1.3 (1989) Structural Welding Code - Sheet Steel

AWS D1.4 (1992) Structural Welding Code - Reinforcing Steel

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

BHMA A 156.3 (1994) Exit Devices

BHMA A 156.4 (1992) Door Controls - Closers

BHMA A 156.8 (1994) Door Controls - Overhead Holders

BHMA A 156.13 (1987) Mortise Locks & Latches

BHMA A 156.20 (1989) Strap and Tee Hinges and Hasps

MILITARY SPECIFICATIONS (MS)

MS MIL-H-29181 (Rev A) Hasp, High Security, Shrouded, for High and Medium Security Padlock

MS MIL-H-43905 (Rev C) Hasps, High Security Padlocks

MS MIL-P-43607 (Rev G; Am 4) Padlock, Key Operated, High Security, Shrouded Shackle

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 80 (1992) Fire Doors and Fire Windows

NFPA 80A (1993) Protection of Buildings from Exterior Fire Exposures

NFPA 101 (1994) Safety to Life from Fire in Buildings and Structures

1.2 DESCRIPTION

Structural steel doors shall be flush mounted in frames. Doors shall be the manually and electrically operated, side hinged, swinging type and horizontal sliding. Each door assembly shall include the door, frame, anchors, hardware, and accessories and shall be provided by a single manufacturer. Frames and anchors shall be capable of transferring blast and rebound reactions to the adjacent supporting structure. Resistance to blast shall be demonstrated either by design calculations or tests on

prototype door assemblies.

1.2.1 Design Requirements

1.2.1.1 Static Material Strength

The static values for minimum yield strength (or yield point) and (ultimate) tensile strength for steel shall be obtained from the applicable material specification. For tensile strength specified in terms of a tensile strength range, the lowest tensile strength specified shall be selected for design. Structural steel having a minimum static yield strength (or yield point) less than 345 MPa (50 ksi) shall be designed using an average yield strength computed as 1.1 times the minimum static yield strength or yield point. When the minimum static yield for structural steel exceeds 345 MPa (50 ksi), the average yield strength shall be taken as equal to the minimum static yield strength or yield point without increase.

1.2.1.2 Dynamic Material Strength

The dynamic material strength shall be computed by applying a dynamic increase factor that accounts for the increase in material strength due to strain rate effects. The dynamic increase factor for structural steel in flexure shall be applied to the average yield strength and shall be 1.29, 1.19, and 1.09 for structural steel having a minimum yield strength (or yield point) of 248 MPa (36 ksi), 345 MPa (50 ksi), and 689 MPa (100 ksi), respectively. The dynamic increase factor for structural steel having a minimum yield strength (or yield point) between these values shall be obtained by interpolation. Optionally, for structural steel in these yield ranges, the dynamic increase factor shall be determined by a detailed analysis that accounts for the time to yield. The dynamic increase factor for structural steel having a minimum yield exceeding 689 MPa (100 ksi) shall be 1.0. The dynamic increase factor for steel sheet and strip used in flexure shall be 1.1 applied to the average yield stress.

1.2.1.3 Structural Member Design

Structural steel section properties for rolled shapes shall be obtained from AISC-01, AISC-03, or steel manufacturers' catalogs. The plastic moment capacity for single plate sections and sections built up from plates and shapes shall be computed as the average of the elastic and plastic section modulus multiplied by the dynamic yield strength, unless otherwise approved. Shear, welds, local buckling, and web crippling of structural steel shall be designed in accordance with AISC-02, the plastic design provisions of AISC-04, or by other approved methods except that for blast design, the load factors and resistance factors shall be equal to 1.0 and the dynamic yield strength shall be substituted for the static yield stress.

1.2.1.4 Dynamic Analysis and Deformation

The door shall be designed using an equivalent single degree of freedom or other approved dynamic analysis method. The maximum door deformation shall be selected by the door manufacturer except that the maximum deformation in flexure shall not exceed the deformation limits specified or indicated. The deformation of structural steel members having a minimum yield strength or yield point greater than 448 MPa (65 ksi) shall not exceed the elastic deflection. Increased resistance due to strain hardening of structural steel in flexure can be used when the ductility ratio exceeds 10 or when

otherwise approved.

1.2.1.5 Rebound Resistance

Rebound resistance shall be the specified or indicated percentage of the door resistance at initial peak response.

1.2.2 Blast Effects

1.2.2.1 Overpressure

The spatial distribution of overpressure shall be uniform unless otherwise specified or indicated. For overpressure specified or indicated without duration, the overpressure waveform shall have a zero rise time and infinite duration.

1.2.2.2 Overpressure Direction

For overpressure identified as seating and for overpressure directions not otherwise specified or indicated, the positive phase overpressure shall be in the direction that causes the door to seat toward the frame.

1.2.2.3 Fragment Resistance

For doors specified or indicated to resist fragments, the door and the door and frame interface shall be designed to prevent fragment perforation and the latches and latching mechanism shall be shielded from fragment damage. The fragment impact point shall be anywhere on the door and frame face exposed to overpressure.

1.2.3 Blast Door Operation

The force required to set the door in motion shall be measured from the 90-degree open position, and the force required to engage and release the latches shall be measured at the latch handle with the door in the normal closed position.

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL PROCEDURES:

SD-01 Data

Blast Resistant Door; GA.

Data on standard blast doors consisting of catalog cuts, brochures, circulars, specifications, and product data that show complete dimensions and completely describe overpressure ratings, rebound ratings, doors, frames, anchors, hardware, and accessories.

Contractor Design Calculations; GA.

Detailed structural analysis and design calculations demonstrating resistance to blast when blast resistance is not demonstrated by prototype tests. Design calculations shall demonstrate adequacy under the blast effects specified or indicated. Design calculations shall include a sketch

of the overpressure waveform; dimensioned sketches of blast resisting elements such as door members, frame members, latches, and hinges; section properties for blast resisting members including built-up sections; the standard under which steel is produced; static and dynamic material strength properties; the resistance, stiffness, mass, elastic natural period, and elastic deflection for flexural members; and the peak deflection, peak support rotation, and time to peak deflection for door members in flexure. Design calculations shall cover initial response, rebound, and all secondary items such as shear, welds, local buckling, web crippling, hinges, and latches.

Test on Prototype Door; GA.

Certified test reports demonstrating blast resistance. Test reports shall include the name and location of the testing agency or laboratory, a description of the testing apparatus, the date of the tests, a description of the door specimen tested, descriptions of loadings, and the value of measured peak door deflection and peak permanent set. Test reports shall include analysis and interpretation of test results.

SD-04 Drawings

Contractor Design of Blast Resistant Doors; GA.

For special doors or standard doors with appreciable modifications, detailed fabrication and assembly drawings indicating the door location and showing dimensions, materials, fabrication methods, hardware, and accessories in sufficient detail to enable the Contracting Officer to check compliance with contract documents. Weld symbols used shall conform to AWS A2.4. These drawings need not be submitted for standard doors for which manufacturer's catalog data is submitted.

SD-06 Instructions

Blast Resistant Door; FIO.

Manufacturer's instructions for installation and field testing.

SD-08 Statements

Manufacturer's Field Service; FIO.

Information describing training to be provided, training aids to be used, and background data on the personnel conducting the training.

SD-09 Reports

Blast Door Shop and Field Operating Tests; GA.

Shop and field operating test reports that include values for opening and closing forces and times, forces required to operate latches, and a description of all operating tests performed.

Fire Rated Blast Door; GA.

In lieu of a UL listing for fire door assemblies, a letter shall be submitted by the testing laboratory which identifies the submitted product by manufacturer and type or model and certifies that it has tested a sample assembly and issued a current listing.

SD-13 Certificates

Certificates of Compliance; GA.

Steel mill reports covering the number, chemical composition, and tension properties for structural quality steels. When blast resistance is demonstrated by calculations, a certificate stating that the door assembly provided was manufactured using the same materials, dimensions, and tolerances shown in the calculations. When blast resistance is demonstrated by prototype testing, a certificate stating that door and frame provided was manufactured using the same materials, dimensions, and tolerances as the tested prototype and listing the hardware and frame anchors required to achieve blast resistance. Each certificate shall be signed by an official authorized to certify in behalf of the manufacturer and shall identify the door assembly and date of shipment or delivery to which the certificate applies.

Fire Rated Blast Door; GA.

Certificate of inspection conforming to NFPA 80, NFPA 80A, and NFPA 101 for fire doors exceeding the size for which label service is available.

Thermal Insulated Blast Door; GA.

Sound Rated Blast Door; GA.

Certification or test report for [thermal insulated] [sound rated] doors listing the type of hardware used to achieve the rating.

SD-19 Operation and Maintenance Manuals

Blast Resistant Door; FIO.

Information bound in manual form consisting of manufacturer's safety precautions, preventative maintenance and schedules, troubleshooting procedures, special tools, parts list, and spare parts data. All material shall be cross referenced to the door designations shown on the drawings.

1.4 QUALIFICATIONS

Welders, welding operators, and weld inspectors shall be qualified in accordance with AWS D1.1 .

1.5 DELIVERY AND STORAGE

Door assemblies delivered and placed in storage shall be stored with protection from weather and dirt, dust, and contaminants.

1.6 WARRANTY

Manufacturer's written warranty covering the blast door assembly for 2 years after acceptance by the Government shall be furnished. This warranty shall provide for repair and replacement of the blast door assembly and individual hardware and accessory items in the event of malfunction due to defects in design, materials, and workmanship except that the warranty need not cover finishes provided by others.

PART 2 PRODUCTS

2.1 MATERIALS

Only structural quality steel materials for which tension properties have been obtained shall be used to resist blast except that commercial quality steel sheet and strip shall be permitted for prototype tested hollow metal doors. Steel used in the door, door frame, and door frame anchors and nonstainless steel fasteners that resist blast shall be selected from the materials specified.

2.1.2 Structural Tubing

Structural tubing shall conform to ASTM A 500, ASTM A 501, or ASTM A 618.

2.1.3 Structural Steel

Structural steel bars, plates, and shapes shall conform to ASTM A 36, ASTM A 242, ASTM A 529, ASTM A 572, or ASTM A 588. Quenched and tempered steel plate shall conform to ASTM A 514.

2.1.4 Fasteners

Steel studs and bolts shall conform to ASTM A 307, ASTM A 325, ASTM A 354, ASTM A 449, ASTM A 490, or ASTM A 687 as applicable. Steel nuts shall conform to ASTM A 563. Hardened circular, beveled, and clipped washers shall conform to ASTM F 436. Steel hex cap screws shall conform to ASTM F 568. Steel socket-headed cap screws shall conform to ASTM A 574. Steel button and flat-headed countersunk cap screws shall conform to ASTM F 835.

2.2 HARDWARE

2.2.1 Hinges

2.2.1.1 General Requirements

Hinges shall be specially manufactured to support the door and to resist any blast induced loading. The number of hinges shall be determined by the blast door manufacturer. Welds used in hinges shall be continuous. Hinges shall be attached to the door and frame using mechanical fasteners except that full surface hinges for doors with locks shall be attached to the door and frame by welding or approved tamper-resistant mechanical fasteners and hinges for doors with locks shall have approved nonremovable pins. Load ratings and fatigue life for ball and roller bearings shall be determined in accordance with ABEMA 9 and ABEMA 11 as applicable and, unless otherwise approved, the bearing steel shall conform to ASTM A 534. Hinges shall be capable of operating for the minimum number of cycles specified without failure or excessive wear under the door service loads where one cycle consists of swinging the door back and forth between the normal closed position and the 90-degree open position, where failure or excessive wear means that the latches do not seat properly or the door does not swing smoothly due to hinge failure or wear, and where door service loads consist of the door weight plus any loads produced by hardware. Rolling bearings shall be factory grease lubricated and either sealed or provided with easily accessible lubrication fittings.

2.2.1.2 Hinge Description

Hinge Type 1 shall be capable of smooth operation for a minimum of 250,000 cycles. This type of hinge shall be provided with structural quality steel

pins and leafs and either rolling bearings in both the thrust and radial directions or hardened steel washer (disc) thrust bearings and rolling radial bearings except that rolling thrust bearings and metallic journal radial bearings shall be permitted for hollow metal doors when the specified overpressure is less than 21 kPa..

2.2.2 Latching System

2.2.2.1 Latching Points

The number of latching points shall be determined by the door manufacturer.

For multiple latching points, latching points can be provided at the head, sill, and jambs.

2.2.2.2 Latching System Operation

Latching systems shall be capable of operating for the same number of cycles specified for the door hinges where one latch operating cycle consists of engaging and releasing using the handle. Latches shall remain engaged until manually released and shall not release under blast loads or rebound. Manually operated latches shall remain in the released position until manually engaged. Self-latching latches shall provide self-activating engagement when the door is swung to the normal closed position. Handles shall release latches under a clockwise motion.

2.2.2.3 Latching Mechanism

Latching mechanisms and latches for structural steel doors shall be mounted on the seating face of the door. Unless otherwise approved, latch handle axles (spindles) for structural steel doors shall extend through the blast load carrying portion of the door and shall be provided with suitable metallic journal bearings. Latch handle axles shall be manufactured of hardened steel or stainless steel, and axles requiring lubrication shall be provided with easily accessible lubrication fittings.

2.2.2.4 Safety Cover

Safety covers shall consist of steel housings that enclose the latching mechanism such that only the operating rods are exposed.

2.2.2.5 Cover Plate

Cover plates for structural steel doors shall be manufactured of minimum 6 mm (1/4 inch) thick plate and shall enclose the entire latching mechanism.

2.2.2.6 Latches

Latches (latch bolts) shall be manufactured of structural quality steel and the latch bolt throw shall not be less than 19 mm (3/4 inch). Latch bolts shall be the sliding type in which the latch bolt slides into a matching strike in the door frame except that latches for doors with and exit devices shall be the sliding type]. Manually operated latches shall draw the door toward the frame during latching.

2.2.2.7 Handle

Handles for doors without locks shall be manufactured of steel castings, forgings, pipe, round tubing, bar, or plate and shall be one piece or have welded joints except that wheel handles can be manufactured of aluminum

castings. Handles for doors with mortise lock and latch sets shall be manufactured of steel castings. Latch handles shall be firmly fastened to axles. Lever handles shall be perpendicular to the door edge when latches are engaged. Single lever handles shall be located at the stile opposite the hinges.

2.2.3 Keying

Keying shall conform to Section 08700 BUILDERS' HARDWARE. Change keys for locks shall be stamped with change number and the inscription "U.S. Property - Do Not Duplicate." Unless otherwise specified, two change keys shall be provided for each lock. Locks shall be furnished with the manufacturer's standard construction key system.

2.2.4 Exit Device

Latches (latch bolts) shall release by depressing the actuation bar using a force of not more than 67 N (15 pounds) applied perpendicular to the door in the swing direction. The exit device shall conform to the finish test values specified in BHMA A 156.3 and shall be of stainless steel construction and plain design with straight, beveled, or smoothly rounded sides, corners, and edges. A touch bar may be provided in lieu of a conventional actuation bar (cross bar). The function numbers for exit devices shall be as defined in BHMA A 156.3.

2.2.5 Straight Steel Bar Door Pull

Straight steel bar door pulls shall be manufactured of round steel bar. The type furnished shall be Type III: 16 mm (5/8 inch) diameter, 200 mm (8 inch) grip and 100 mm (4 inch) projection with 24 mm (15/16 inch) inside bend radiuses. Grip and projection dimensions are measured from the bar centerline. The pull shall be attached to the door by fillet welding all around.

2.2.6 High Security Hasp

High security hasps shall conform to MS MIL-H-43905, Style __1__ corrosion resistant steel, attached by welding.

2.2.7 Shrouded Hasp

High security shrouded hasps shall conform to MS MIL-H-29181, Style 1 or 2 as applicable.

2.3 ACCESSORIES

2.3.1 Subframe

At the Contractor's option, a subframe can be provided and built into the structure prior to installation of the frame. The subframe and subframe anchors shall be capable of transferring blast and rebound reactions to the adjacent structure, and the frame shall be capable of transferring these reactions to the subframe. The subframe shall be fabricated in the same manner specified for the frame.

2.4 FABRICATION

2.4.1 Shop Assembly

Welding shall be in accordance with AWS D1.1. Stainless steel shall be welded using electrodes conforming to AWS A5.4. Structural steel doors shall be of welded construction. In order to reduce distortion and residual stresses, a welding sequence shall be used. All welds shall be stress relieved, and welded doors and frames shall be post-weld straightened. Fabricated steel shall be well-formed to shape and size, with sharp lines and angles. Intermediate and corner joints shall be coped or mitered. Exposed welds shall be dressed smooth. The stiles and top of built-up structural steel doors shall be closed using channel shapes or plates.

2.4.2 Thermal Insulation

The interior cells between the unitized grid shall be completely filled with thermal insulation material. The U value through the door (panel) shall not exceed 1.36 W per square meter per degree K (0.24 Btu per square foot per hour per degree F)

2.4.3 Shop Finishing

Shop priming of steel surfaces shall conform to Section 09900PAINTING, GENERAL except that surfaces that will be embedded in concrete need not be primed. Galvanizing of doors and frames shall conform to ASTM A 123 or other approved methods. Surfaces that will be embedded in concrete need not be galvanized and the interior of hollow metal doors may be treated with an approved rust inhibitor in lieu of galvanizing. Galvanizing of exposed portions of concrete anchors, nonstainless steel fasteners, and hardware other than factory finished hardware shall conform to ASTM A 153 or other approved methods.

2.4.4 Clearance

The clearance between the seated steel surfaces of structural steel doors and frames shall not exceed 1.6 mm. The lateral clearance between flush mounted structural steel doors and frames shall not exceed 6 mm at the head and jambs and the clearance between the meeting edges of pairs of doors shall not exceed 13 mm. [

2.5 BLAST DOOR ASSEMBLIES

2.5.1 Door 1,2,3,4; Steel

2.5.1.1 Type

Type shall be structural steel HORIZONTAL SLIDING

2.5.1.2 Overpressure

Overpressure shall be 83 kPa (with a INFINITEmillisecond duration in the seating. The shock and gas overpressure waveform shall be as indicated.

2.5.1.3 Rebound

Rebound resistance shall be 50 percent.

2.5.1.4 Deformation Limits

The ductility ratio shall not exceed 10 and the support rotation shall not exceed 2 degrees.

2.5.1.5 Hardware

Full surface hinges shall be Type 1. Jamb latching points and latch engagement and sliding latch bolts shall be provided. The latching mechanism shall be cover plated. A high security hasp shall be provided.

2.5.1.6 Operating Forces

[Maximum operating forces shall be 180 N (40 pounds) to set the door in motion and 90 N (20 pounds) to SLIDE the door. Maximum force to engage and release latches shall be 90 N (20 pounds).]

2.5.1.7 Accessories

A safety device shall be provided.

2.5.2 Door 5,6,7; Steel

2.5.2.1 Type

Type shall be structural steel.

2.5.2.2 Overpressure

Overpressure shall be 83 kPa (12 psi) with a INFINITE millisecond duration in the seating direction. The shock and gas overpressure waveform shall be as indicated.

2.5.2.4 Rebound

Rebound resistance shall be 100 percent.

2.5.2.5 Deformation Limits

The ductility ratio shall not exceed 10 and the support rotation shall not exceed 2 degrees.

2.5.2.6 Hardware

Full surface hinges shall be Type 1. Multiple Jamb latching points and a single lever handle operated from the seating face with self-latching latch engagement and either sliding or lever latch bolts shall be provided. The latching mechanism shall be safety. A Type I straight steel bar door pull and high security hasp, and surface door closer shall be provided.

2.5.2.7 Operating Forces

Maximum operating forces shall be [135 N (30 pounds) to set the door in motion and 90 N (20 pounds) to swing the door. Maximum force to engage and release latches shall be 90 N (20 pounds).

2.5.2.8 Door 8 ; STEEL

2.5.2.8.1 Type

Type shall be structural steel[, and fire-rated.

2.6 Overpressure

Overpressure shall be 83 kPa (12 psi) in the seating direction .

2.7 Rebound

Rebound resistance shall be 50 100 percent.

2.8 Hardware

Full surface hinges shall be Type 1. Multiple Jamb latch points and a single lever handle operated from the seating face with self-latching latch engagement and lever latch bolts shall be provided. Exit device with multiple latch points jamb latch points shall be provided. Mortise lock and latch set shall be provided.

2.9 Operating Forces

Maximum operating forces shall be 90 N (20 pounds) to set the door in motion and 70 N (15 pounds) to swing the door. Operating forces shall conform to NFPA 101. Maximum force shall be 90 N (20 pounds) to engage and release latches.

2.10 TESTS, INSPECTIONS, AND VERIFICATIONS

2.10.1 Prototype Static Test

Static tests on prototype door assemblies shall demonstrate that the door will resist the blast overpressure. Static tests will be accepted only if the door and frame proposed are manufactured using the same materials, dimensions, and tolerances as those in the prototype static test and the static overpressure used in the test is at least two times the blast overpressure. Static test reports shall be supplemented with calculations that demonstrate rebound resistance when rebound is not tested.

2.10.2 Prototype Blast Test

Blast tests on the prototype door assembly shall demonstrate that the door will resist the overpressure waveform. Blast tests will be accepted only if the door and frame proposed are manufactured using the same materials, dimensions, and tolerances as those in the prototype blast tests. The rise time of the test waveform shall be zero or subject to approval. For an overpressure with infinite duration, the overpressure used in the test shall be not less than that specified or indicated for a duration equal to at least five times the natural period of the door and the test report shall be supplemented with calculations that demonstrate the specified or indicated rebound resistance.

2.10.3 Shop Operating Test

Prior to shipment, each door assembly shall be fully erected in a supporting structure and tested for proper operation. Such testing shall include opening, closing, and operating all moving parts to ensure smooth operation and proper clearance, fit, and seating. The operating forces and opening and closing times shall be determined. The Contracting Officer shall be notified at least 7 calendar days

prior to the start of testing and all doors shall be tested in the presence of the Contracting Officer. A test report shall be prepared and three copies furnished within 7calendar days after testing.

2.10.4 Air Leakage Test

Each door assembly for which thermal insulation is specified shall be factory tested for air leakage rate in accordance with ASTM E 283. The rate of air leakage per unit length of crack shall not exceed 0.90 L/s (0.20 cfm) using a pressure difference of 76.7 Pa (1.57 psf). Prototype tests can be substituted for door assembly tests when the prototype door, frame, and hardware tested are equivalent to that provided or when otherwise approved.

2.10.5.1 Fire Rating Test and Inspection

Fire-rated door assemblies shall bear the listing identification label of the UL, or other nationally recognized testing laboratory qualified to perform tests of fire door assemblies in accordance with ASTM E 152 and having a listing for the tested assemblies. Doors exceeding the size for which listing label service is offered shall be inspected in accordance with NFPA 80, NFPA 80A, and NFPA 101.

2.10.6 ELECTRIC OPERATORS

Operators shall be furnished complete with electric motor, reduction gears, magnetic brake, friction clutch, emergency release for manual operation, heavy duty roller chain, controls, limit switches, and other accessories. The operator shall be designed to permit motor removal without affecting limit-switch timing on emergency auxiliary operators. A manually operated crank-gear or chain-gear mechanism capable of moving door with max. force of 200 N shall be provided on horizontal sliding doors, to permit manual operation. Manual operation may be through a gear box.

2.10.7 MOTOR

Motor shall be totally enclosed, constant duty type, instantly reversible, capable of moving door at not less than 1.5mm per second and designed for high frequency operation. Motor shall have a short-time rating of not less than 5 minutes.

2.10.8 CONTROLS

Each door motor shall have an enclosed reversing across-the-line- type magnetic starter having thermal overload protection, solenoid-operated brake, limit switches, and two remote-control switches. The starter shall conform to NEMA Pub. No. ICS 2. Remote-control switches shall be of the tree-button type with buttons marked "OPEN", "CLOSE", and "STOP." CLOSE button shall be momentary-contact type requiring constant pressure to maintain motion of the door. Pushbuttons shall be full-guarded type to prevent accidental operation. Limit switches shall automatically stop the doors at their fully opened and closed positions. Positions of the limit switches shall be readily adjustable.

2.10.9 TRANSFORMERS

Transformers shall be provided to reduce the voltage on the control circuits to a maximum of 120 volts.

2.10.10 SAFETY DEVICE

The bottom edge of electrically operated doors shall have a safety device that will immediately reverse the door movement upon contact with an obstruction. The safety device shall be installed across the entire width of the door and shall not substitute for a limit switch.

2.10.11 ELECTRICAL WORK

Electric-motor-driven devices required for operation of the doors and any wiring required but not indicated on the electrical drawings shall be provided under this section. Electrical equipment and wiring shall conform to SECTION: ELECTRICAL WORK, INTERIOR. Flexible connections between door and fixed supports shall be type SO cable. The cable shall have a spring-loaded automatic take up reel or equivalent device. The flexible connection shall incorporate a solid copper ground connection from building structural steel to door structural steel to provide safety and static grounding.

PART 3 EXECUTION

3.1 INSTALLATION

Doors and frames shall be installed in accordance with the manufacturer's written instructions. Pressed steel frames for hollow metal doors shall be fully grouted. Exposed surfaces shall be finish painted in accordance with Section 09900 PAINTING, GENERAL. Galvanized surfaces damaged prior to final acceptance shall be repaired in accordance with ASTM A 780 to the same thickness as the original galvanizing.

3.2 TESTS

After installation is completed, each door shall be field tested for operation, clearance, fit, and seating by operating the door and hardware through at least 10 operating cycles. Door and hardware operation shall be tested using the forces specified. Personnel and equipment required to perform field testing shall be provided by the Contractor. Unless waived, all field tests shall be performed in the presence of the Contracting Officer. After testing is completed, test reports shall be prepared and three copies furnished.

3.3 MANUFACTURER'S FIELD SERVICE

Installation and testing of door assemblies shall be under the supervision of the door manufacturer's erection engineer. Upon completion of the work, and at a time designated by the Contracting Officer, the services of one engineer and other technical personnel as required shall be provided for a period of not less than 4 hours to instruct Government personnel in the operation and maintenance of the blast doors and all other items furnished under this specification section. The instructions shall also include use of the operation and maintenance manual. The instructions shall include videotapes. An instruction outline and procedure shall be submitted and approved prior to scheduling the instruction. One copy of all instruction material shall be provided at the time of instruction.

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SECTION 15250

THERMAL INSULATION FOR MECHANICAL SYSTEMS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 167	(1993) Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
ASTM A 580	(1995) Stainless and Heat-Resisting Steel Wire
ASTM A 641	(1992) Zinc-Coated (Galvanized) Carbon Steel Wire
ASTM B 209	(1995) Aluminum and Aluminum-Alloy Sheet and Plate
ASTM C 195	(1990) Mineral Thermal Insulating and Cement
ASTM C 449	(1995) Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement
ASTM C 533	(1985; R 1990) Calcium Silicate Block and Pipe Thermal Insulation
ASTM C 534	(1994) Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form
ASTM C 547	(1995) Mineral Fiber Preformed Pipe Insulation
ASTM C 552	(1991) Cellular Glass Thermal Insulation
ASTM C 553	(1992) Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications
ASTM C 612	(1993) Mineral Fiber Block and Board Thermal Insulation
ASTM C 647	(1995) Properties and Tests of Mastics and Coating Finishes for Thermal Insulation
ASTM C 795	(1992) Thermal Insulation for Use in

	Contact With Austenitic Stainless Steel
ASTM C 916	(1985; R 1990) Adhesives for Duct Thermal Insulation
ASTM C 920	(1994) Elastomeric Joint Sealants
ASTM C 921	(1989) Determining the Properties of Jacketing Materials for Thermal Insulation
ASTM D 3278	(1989) Test Methods for Flash Point of Liquids by Setaflash Closed-Cup Apparatus
ASTM E 84	(1995a) Surface Burning Characteristics of Building Materials
ASTM E 96	(1995) Water Vapor Transmission of Materials

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS
INDUSTRY (MSS)

MSS SP-69	(1991) Pipe Hangers and Supports - Selection and Application
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MIDWEST INSULATION CONTRACTORS ASSOCIATION (MICA)

MICA-01	(1993) National Commercial & Industrial Insulation Standards
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NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 90A	(1993) Installation of Air Conditioning and Ventilating Systems
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UNDERWRITERS LABORATORIES (UL)

UL 723	(1993; Rev Apr 1994) Test for Surface Burning Characteristics of Building Materials
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1.2 SYSTEM DESCRIPTION

Field-applied insulation and accessories on mechanical systems shall be as specified herein; factory-applied insulation is specified under the piping, duct or equipment to be insulated. Field applied insulation materials required for use on Government-furnished items as listed in the SPECIAL CONTRACT REQUIREMENTS shall be furnished and installed by the Contractor.

1.3 GENERAL QUALITY CONTROL

1.3.1 Standard Products

Materials shall be the standard products of manufacturers regularly engaged in the manufacture of such products and shall essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening.

1.3.2 Installer's Qualifications

Qualified installers shall have successfully completed three or more similar type jobs within the last 5 years.

1.3.3 Surface Burning Characteristics

Unless otherwise specified, insulation not covered with a jacket shall have a flame spread rating no higher than 75 and a smoke developed rating no higher than 150. The outside surface of insulation systems which are located in air plenums, in ceiling spaces, and in attic spaces shall have a flame spread rating no higher than 25 and a smoke developed rating no higher than 50. Insulation materials located exterior to the building perimeter are not required to be fire-rated. Flame spread and smoke developed ratings shall be determined by ASTM E 84. Insulation shall be tested in the same density and installed thickness as the material that shall be used in the actual construction. Jackets shall comply with the flame spread and smoke developed ratings required by ASTM C 921.

1.3.4 Identification of Materials

Packages or standard containers of insulation, jacket material, cements, adhesives, and coatings delivered for use, and samples required for approval shall have manufacturer's stamp or label attached giving the name of the manufacturer and brand, and a description of the material.

1.4 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL PROCEDURES:

SD-01 Data

Thermal Insulation Materials; FIO.

A complete list of materials, including manufacturer's descriptive and technical literature, performance data, catalog cuts, and installation instructions. Materials furnished under this section of the specification shall be submitted at one time. A schedule indicating the product number, k-value, thickness and furnished accessories for each mechanical system requiring insulation shall be included.

SD-14 Samples

Thermal Insulation Materials; FIO.

A display of insulated sections as specified in this section, after approval of materials and prior to insulating any piping or ductwork. Each material used shall be identified, by indicating on an attached sheet the specification requirement for the material and the material by each manufacturer intended to meet the requirement. Display sample sections will be inspected at the jobsite by the Contracting Officer. Approved display sample sections shall remain on display at the jobsite during the construction period. Upon completion of construction, the display sample sections will be returned to the Contractor.

Pipe Insulation Display Sections: Display sample sections shall include as a minimum an elbow or tee, a valve, dielectric unions and flanges, a hanger

with protection shield and insulation insert, or dowel as required, at support point, method of fastening and sealing insulation at longitudinal lap, circumferential lap, butt joints at fittings and on pipe runs, and terminating points for each type of pipe insulation used on the job, and for hot pipelines and cold pipelines, both interior and exterior, even when the same type of insulation is used for these services.

Duct Insulation Display Sections: Display sample sections for rigid and flexible duct insulation used on the job. A display section for duct insulation exposed to weather.

SD-18 Records

Thermal Insulation Materials; FIO.

Three copies of a booklet indicating the types of insulation by referencing MICA-01, at the jobsite. After approval of materials and prior to insulating any equipment, a booklet shall be prepared and submitted for approval which contains marked-up MICA-01 plates or detail drawings showing the insulation material and insulating system for each type of equipment which is required to be insulated per paragraph EQUIPMENT INSULATION INSTALLATION. The MICA plates shall be marked-up showing the materials to be installed in accordance with the requirements of this specification for the specific insulation application. The Contractor shall submit all MICA Plates required to show the entire insulating system, including Plates required to show insulation penetrations, vessel bottom and top heads, legs, and skirt insulation as applicable. If the Contractor elects to submit detailed drawings instead of marked-up MICA Plates, the detail drawings shall show cut-away, section views, and details indicating each component of the insulation system and showing provisions for insulating jacketing, and sealing portions of the equipment. The drawings shall be labeled with a description of each material type with materials and insulating systems, in accordance with this specification. Each material and insulating system that is used shall be identified by indicating the specification requirement for the material, and the material by each manufacturer that is intended to meet the requirement. Three copies of the booklet shall be submitted at the jobsite to the Contracting Officer. One copy of the approved booklet shall remain with the display sample and two copies shall be provided for Government use.

1.5 STORAGE

Materials shall be delivered in the manufacturer's unopened containers. Materials delivered and placed in storage shall be provided with protection from weather, humidity, dirt, dust and other contaminants by the Contractor. Insulation material and supplies that become dirty, dusty, wet, or otherwise contaminated may be rejected by the Contracting Officer.

PART 2 PRODUCTS

2.1 GENERAL MATERIALS

Materials shall be compatible and shall not contribute to corrosion, soften, or otherwise attack surfaces to which applied in either the wet or dry state. Materials to be used on stainless steel surfaces shall meet ASTM C 795 requirements. Materials shall remain in the manufacturer's unopened containers until actual use and shall not be transferred to any other containers. Materials shall be asbestos free and conform to the following:

2.1.1 Adhesives

2.1.1.1 Acoustical Lining Insulation Adhesive

Insulation shall be applied in cut-to-size pieces attached to the interior of the duct with a nonflammable, fire-resistant adhesive conforming to ASTM C 916, Type I, NFPA 90A, UL 723, and ASTM E 84. Exposed edges of the liner at the duct ends and at other joints where the lining will be subject to erosion shall be coated with a heavy brush coat of the nonflammable, fire-resistant adhesive to prevent delamination of glass fibers.

2.1.1.2 Mineral Fiber Insulation Cement

Cement shall be in accordance with ASTM C 195.

2.1.1.3 Lagging Adhesive

Lagging adhesives shall be nonflammable, fire-resistant in accordance with NFPA 90A, UL 723, and ASTM E 84. Adhesives shall be either the Class 1 or Class 2 type. Class 1 adhesive shall be pigmented white and be suitable for bonding fibrous glass cloth to faced and unfaced fibrous glass insulation board; for bonding cotton brattice cloth to faced and unfaced fibrous glass insulation board; for sealing edges of and bonding fibrous glass tape to joints of fibrous glass board; or for bonding lagging cloth to thermal insulation. Class 2 adhesive shall be pigmented white and be suitable for attaching fibrous glass insulation to metal surfaces. Lagging adhesives shall be applied in strict accordance with the manufacturer's recommendations.

2.1.2 Contact Adhesive

Adhesive may be dispersed in a nonhalogenated organic solvent with a low flash point (flash point plus or minus 3.9 degrees C) or, dispersed in a nonflammable organic solvent which shall not have a fire point below 93.3 degrees C. The adhesive shall not adversely affect, initially or in service, the insulation to which it is applied, nor shall it cause any corrosive effect on metal to which it is applied. Any solvent dispersing medium or volatile component of the adhesive shall have no objectionable odor and shall not contain any benzene or carbon tetrachloride. The dried adhesive shall not omit nauseous, irritating, or toxic volatile matters or aerosols when the adhesive is heated to any temperature up to 100 degrees C. The adhesive shall be nonflammable, fire resistant conforming to ASTM E 84.

2.1.3 Caulking

ASTM C 920, Type S, Grade NS, Class 25, Use A.

2.1.4 Corner Angles

Nominal 0.4064 mm (0.016 inch) aluminum 25.4 by 25.4 mm (1 by 1 inch) with factory applied kraft backing. Aluminum shall be ASTM B 209, Alloy 3003, 3105, or 5005.

2.1.5 Finishing Cement

Mineral fiber hydraulic-setting thermal insulating cement ASTM C 449.

2.1.6 Glass Tape

Glass tape shall meet the requirements of UL 723 and ASTM E 84.

2.1.6.1 Plain Weave, Untreated

The ends shall be properly interlocked with the picks to ensure that there shall be no raveling of the tape edges. It shall have an average thickness of 0.1778 plus or minus 0.0254 mm, warp ends/wales of 17 plus or minus 1 per centimeter or filling picks/courses of 13 plus or minus 1 per centimeter, a minimum breaking strength of 2679 gram per mm of width, and after heating to 482 degrees C for 2 hours a minimum breaking strength of 714 grams per mm of width.

2.1.6.2 Knitted, Untreated

The wales shall be properly interlocked with the courses to ensure that there shall be no raveling of the tape edges. It shall have an average thickness of 0.1778 plus or minus 0.0254 mm, warp end/wales of 6 plus or minus 1 per centimeter, a minimum breaking strength of 714 grams per mm of width, and after heating to 482 degrees C for 2 hours a minimum breaking strength of 375 grams per mm of width.

2.1.6.3 Distortion Requirements

There shall be no distortion of the tape when a sample 610 mm in length is spread across a flat horizontal surface and observed for evidence of distortion (such as tendency to curl rather than lie flat). The width tolerance is plus or minus 3.175 mm.

2.1.7 Glass Cloth

The maximum average diameter of the glass fibers used for the yarns shall not exceed 0.00761 mm. The cloth shall meet the requirements of UL 723 and the following properties.

Minimum breaking strength

Warp	3572 grams/mm	
Filling	3214 grams/mm	
After heating to	482 degrees C	for 2 hrs
Warp	1071 grams/mm	
Filling	1071 grams/mm	

Nominal width of the cloth shall be 1 meters (3 feet) with the following tolerances:

Up to and including	1016 mm plus or minus 13 mm
Over	1016 mm and less than 1524 mm plus or minus 19 mm
Over	1524 mm plus or minus 25 mm

2.1.8 Staples

Outward clinching type monel or ASTM A 167, Type 304 or 316 stainless steel.

2.1.9 Jackets

ASTM C 921, Type I, moisture vapor transmission maximum 0.02 perms, puncture resistance minimum 50 Beach units on all surfaces except concealed ductwork, where a minimum puncture resistance of 25 Beach units is allowable, tensile strength minimum 6.1 N/mm (35 pounds/inch) width; Type II, puncture resistance minimum 25 Beach units, tensile strength minimum 3.5 N/mm (20 pound/inch) width. Aluminum jackets shall be corrugated, embossed or smooth sheet, 0.4064 mm (0.016 inch) nominal thickness; ASTM B 209, Temper H14, Temper H16, Alloy 3003, 5005, or 3105 with factory applied moisture barrier. Corrugated aluminum jacket shall not be used outdoors. Aluminum jacket securing bands shall be Type 304 stainless steel, 0.3962 mm (0.015 inch) thick, 12.7 mm (1/2 inch) wide for pipe under 300 mm (12 inch) diameter and 19.1 mm (3/4 inch) wide for pipe over 300 mm (12 inch) diameter. Aluminum jacket circumferential seam bands shall be 50.8 by 0.4064 mm (2 by 0.016 inch) aluminum matching jacket material. Bands for insulation belowground shall be 19.1 by 0.5080 mm (3/4 by 0.020 inch) thick stainless steel, or fiberglass reinforced tape. The jacket may, at the option of the Contractor, be provided with a factory fabricated Pittsburgh or "Z" type longitudinal joint. When the "Z" joint is used, the bands at the circumferential joints shall be designed by the manufacturer to seal the joints and hold the jacket in place. Polyvinyl chloride (PVC) jacket and fitting covers shall be made from rigid sheet with high impact strength, with minimum thickness 0.7620 mm (0.030 inch). Insulation under PVC jacket shall meet jacket manufacturer's written recommendations.

2.1.10 Vapor Barrier Coating

The vapor barrier coating shall be fire and water resistant and appropriately selected for either outdoor or indoor service. Color shall be white. The water vapor permeance of the compound shall not exceed 0.05 perm and shall be determined according to procedure B of ASTM E 96 utilizing apparatus described in ASTM E 96. The coating shall be a nonflammable, fire resistant type conforming to ASTM E 84, NFPA 90A, and UL 723. The flash point of the compound shall not be less than 26.7 degrees C and shall be determined in accordance with ASTM D 3278. All other application and service properties shall be in accordance with ASTM C 647.

2.1.11 Wire

Soft annealed ASTM A 580 Type 302, 304 or 316 stainless steel, 16 or 18 gauge.

2.2 PIPE INSULATION MATERIALS

Pipe insulation materials shall be as follows:

2.2.1 Aboveground Hot Pipeline

For aboveground hot pipeline (above 16 degrees C) insulation the following requirements shall be met.

2.2.1.1 Mineral Fiber

ASTM C 547, Class 1 or Class 2 as required for the operating temperature range.

2.2.1.2 Calcium Silicate

ASTM C 533, Type I indoor only, or outdoors above 121 degrees C (250 degrees F) pipe temperature.

2.2.1.3 Cellular Glass

ASTM C 552, Type II and Type III.

2.2.1.4 Flexible Cellular Insulation

2.2.2 DUCT INSULATION MATERIALS

Duct insulation materials shall be as follows:

2.2.2.1 Rigid Mineral Fiber

ASTM C 612, Class 1.

2.2.2.2 Flexible Mineral Fiber

ASTM C 553, Type I, Class B-2.

2.2.2.3 Cellular Glass

ASTM C 552, Type I.

2.2.3 EQUIPMENT INSULATION MATERIALS

Equipment insulation materials shall be as follows:

2.2.3.1 Hot Equipment Insulation

For temperatures above 16 degrees C.

2.2.3.1.1 Rigid Mineral Fiber

ASTM C 612, Class 2, 3, 4 or 5 as required for temperature encountered to 982 degrees C (1800 degrees F).

2.3 Flexible Mineral Fiber

ASTM C 553, Type I, Class B-4 to 204 degrees C (400 degrees F).

2.4 Calcium Silicate

ASTM C 533, Type I, indoors only, or outdoors above 121 degrees C (250 degrees F). Pipe shape may be used on diesel engine exhaust piping and mufflers to 649 degrees C (1200 degrees F).

2.5 Cellular Glass

ASTM C 552, Type I, Type III, or Type IV as required.

2.6 Flexible Cellular Insulation

ASTM C 534, Type II to 93 degrees C (200 degrees F).

PART 3 EXECUTION

3.1 APPLICATION - GENERAL

3.1.1 Installation

Except as otherwise specified, material shall be installed in accordance with the manufacturer's written instructions. Insulation materials shall not be applied until tests specified in other sections of this specification are completed. Material such as rust, scale, dirt and moisture shall be removed from surfaces to receive insulation. Insulation shall be kept clean and dry. Insulation shall not be removed from its shipping containers until the day it is ready to use and shall be returned to like containers or equally protected from dirt and moisture at the end of each workday. Insulation that becomes dirty shall be thoroughly cleaned prior to use. If insulation becomes wet or if aforementioned cleaning does not restore the surfaces to like new condition, the insulation may be rejected, and if rejected, shall be immediately removed from the jobsite. Joints shall be staggered on multilayer insulation. Mineral fiber thermal insulating cement shall be mixed with demineralized water when used on stainless steel surfaces. Insulation, jacketing and accessories shall be installed in accordance with MICA-01 standard plates except where modified herein or on the drawings.

3.1.2 Firestopping

Where pipes and ducts pass through fire walls, fire partitions, above grade floors, and fire rated chase walls, the penetration shall be sealed with firestopping materials as specified in Section 07270 FIRESTOPPING.

3.1.3 Painting and Finishing

Painting shall be as specified in Section 09900 PAINTING, GENERAL.

3.1.4 Flexible Cellular Insulation

Flexible cellular insulation shall be installed with seams and joints sealed with a contact adhesive. Flexible cellular insulation shall not be used on surfaces greater than 93 degrees C (200 degrees F). Insulation exposed to weather and not shown to have jacketing shall be protected with two coats of UV resistant finish as recommended by the manufacturer after the adhesive is dry.

3.1.5 Welding

No welding shall be done on piping, duct or equipment without written approval of the Contracting Officer. The capacitor discharge welding process may be used for securing metal fasteners to duct.

3.2 PIPE INSULATION INSTALLATION

3.2.1 Pipe Insulation

3.2.1.1 General

Pipe insulation shall be continuous and installed on fittings and appurtenances unless specified otherwise. Installation shall be with full length units of insulation and using a single cut piece to complete a run. Cut pieces or scraps abutting each other shall not be used. Pipe insulation shall be omitted on the following:

- a. Pipe used solely for fire protection.
- d. Sanitary drain lines.

- e. Unions in pipe above 16 degrees C.
- f. Strainers in pipe above 16 degrees C.
- g. Check valves in pipe above 16 degrees C.
- h. Air chambers.

3.2.1.2 Pipes Passing Through Sleeves

- a. Pipe insulation shall be continuous through the sleeve .
- b. An aluminum jacket with factory applied moisture barrier shall be provided over the insulation wherever penetrations require sealing.
- c. Where penetrating interior walls, the aluminum jacket shall extend 50 mm beyond either side of the wall and shall be secured on each end with a band.
- d. Where penetrating floors, the aluminum jacket shall extend from a point below the backup material to a point 250 mm above the floor with one band at the floor and one not more than 25 mm from the end of the aluminum jacket.
- e. Where penetrating waterproofed floors, the aluminum jacket shall extend from below the backup material to a point 50 mm above the flashing with a band 25 mm from the end of the aluminum jacket.
- f. Where penetrating exterior walls, the aluminum jacket required for pipe exposed to weather shall continue through the sleeve to a point 50 mm beyond the interior surface of the wall.

3.2.1.3 Pipes Passing Through Hangers

- a. Insulation, whether hot or cold application, shall be continuous through hangers. All horizontal pipes 50 mm (2 inches) and smaller shall be supported on hangers with the addition of a Type 40 protection shield to protect the insulation in accordance with MSS SP-69. Whenever insulation shows signs of being compressed, or when the insulation or jacket shows visible signs of distortion at or near the support shield, insulation inserts as specified below for piping larger than 50 mm (2 inches) shall be installed.
- b. Horizontal pipes larger than 50 mm (2 inches) at 16 degrees C (60 degrees F) and above shall be supported on hangers with the addition of a Type 39 saddle in accordance with MSS SP-69.
- c. Horizontal pipes larger than 50 mm (2 inches) below 16 degrees C shall be supported on hangers with the addition of a Type 40 protection shield in accordance with MSS SP-69. An insulation insert of cellular glass or calcium silicate shall be installed above each shield. The insert shall cover not less than the bottom 180 degree arc of the pipe. Inserts shall be the same thickness as the insulation, and shall extend 50 mm on each end beyond the protection shield. When insulation inserts are required per the above, and the insulation thickness is less than 25 mm (1 inch), wooden or cork dowels or blocks may be installed between the pipe and the shield to prevent the weight of the pipe

from crushing the insulation as an option to installing insulation inserts. The insulation jacket shall be continuous over the wooden dowel, wooden block, or insulation insert.

- d. Vertical pipes shall be supported with either Type 8 or Type 42 riser clamps with the addition of two Type 40 protection shields in accordance with MSS SP-69 covering the 360 degree arc of the insulation. An insulation insert of cellular glass or calcium silicate shall be installed between each shield and the pipe. The insert shall cover the 360 degree arc of the pipe. Inserts shall be the same thickness as the insulation, and shall extend 50 mm on each end beyond the protection shield. When insulation inserts are required per the above, and the insulation thickness is less than 25 mm (1 inch), wooden or cork dowels or blocks may be installed between the pipe and the shield to prevent the hanger from crushing the insulation as an option instead of installing insulation inserts. The insulation jacket shall be continuous over the wooden dowel, wooden block, or insulation insert. The verticle weight of the pipe shall be supported with hangers located in a horizontal section of the pipe. When the pipe riser is longer than 9 m, the weight of the pipe shall be additionally supported hangers in the vertical run of the pipe which are directly clamped to the pipe, penetrating the pipe insulation. These hangers shall be insulated and the insulation jacket sealed as indicated herein for anchors in a similar service.
- e. Inserts shall be covered with a jacket material of the same appearance and quality as the adjoining pipe insulation jacket, shall overlap the adjoining pipe jacket 38 mm, and shall be sealed as required for the pipe jacket. The jacket material used to cover inserts in flexible cellular insulation shall conform to ASTM C 921, Type 1, and is allowed to be of a different material than the adjoining insulation material.

3.2.2 Aboveground Hot Pipelines

For hot pipelines above 16 degrees C the following shall be included:

- b. Steam.
- c. Condensate.

3.2.2.1 Insulation Thickness

Insulation thickness shall be determined using the manufacturer's published thermal conductivity k, and the applicable TABLE I or TABLE II.

TABLE I

REQUIRED THICKNESS (IN mm) OF PIPE INSULATION

FOR HANDLING STEAM TO 103.4 kPa AND FLUIDS OTHER THAN

k = thermal conductivity (average) watt per meter degree Kelvin

thickness at a mean temperature of 297 degrees K

Thermal conductivity k	Pipe Size, mm						
	50 or less	65 to 80	100	125 to 150	200	250	300
0.036	38.1	38.1	50.8	50.8	50.8	50.8	63.5
0.043	38.1	50.8	63.5	63.5	63.5	63.5	76.2
0.051	50.8	63.5	63.5	63.5	88.9	88.9	88.9
0.058	63.5	88.9	88.9	76.2	101.6	101.6	101.6
0.065	76.2	101.6	101.6	88.9	114.3	114.3	114.3

TABLE II

REQUIRED THICKNESS (IN mm) OF PIPE INSULATION FOR PIPES
HANDLING STEAM TO 1724 kPA AND FLUIDS OTHER THAN

k = thermal conductivity (average) watt per meter degree Kelvin
thickness at a mean temperature of 297 degrees C

Thermal conductivity k	Pipe Size, mm						
	50 or less	65 to 80	100	125	200	250	300
0.036	50.8	63.5	63.5	88.9	88.9	88.9	88.9
0.043	50.8	63.5	63.5	88.9	88.9	88.9	88.9
0.051	76.2	88.9	88.9	101.6	101.6	101.6	101.6
0.058	88.9	101.6	101.6	114.3	114.3	114.3	114.3
0.065	114.3	127.0	127.0	139.7	139.7	139.7	139.7

*When runouts to terminal units exceed 4 m, the entire length of runout shall be insulated like the main feed pipe.

3.2.2.2 Jacket for Insulated Pipe

Insulation shall be covered with a factory applied Type II jacket or field applied aluminum where required or seal welded PVC.

3.2.2.3 Insulation for Straight Runs

- a. Insulation shall be applied to the pipe with joints tightly butted.
- b. Longitudinal laps of the jacket material shall overlap not less than 38 mm, and butt strips 75 mm (3 inches) wide shall be provided for circumferential joints.

- c. Laps and butt strips shall be secured with adhesive and stapled on 100 mm centers if not factory self-sealing. Adhesive may be omitted where pipe is concealed.
- d. Factory self-sealing lap systems may be used when the ambient temperature is between 4 degrees C and 49 degrees C (40 degrees and 120 degrees F) and shall be installed in accordance with manufacturer's instructions. Laps and butt strips shall be stapled whenever there is nonadhesion of the system. Where gaps occur, the section shall be replaced or the gap repaired by applying adhesive under the lap and then stapling.
- e. Breaks and punctures in the jacket material shall be patched by wrapping a strip of jacket material around the pipe and be secured with adhesive and stapled on 100 mm centers if not factory self-sealing. Adhesive may be omitted where pipe is concealed. Patch shall extend not less than 38 mm past the break.

3.2.2.4 Insulation for Fittings and Accessories

- a. The run of the line pipe insulation shall have the ends brought up to the item.
- b. Insulation of the same thickness and conductivity as the adjoining pipe insulation, either premolded or segmented, shall be placed around the item abutting the adjoining pipe insulation, or if nesting size insulation is used, overlapping 50 mm or one pipe diameter. Loose fill mineral fiber or insulating cement shall be used to fill the voids. Insulation for elbows less than 80 mm (3 inch) size shall be premolded. Insulation for elbows 80 mm (3 inch) size and larger shall be either premolded or segmented. Elbows insulated using segments shall have not less than 3 segments per elbow. Insulation may be wired or taped on until finish is applied.
- c. Upon completion of installation of insulation on flanges, unions, valves, anchors, fittings and accessories, terminations and insulation not protected by factory vapor barrier jackets or PVC fitting covers shall be protected with two coats of Class 1 adhesive applied with glass tape embedded between coats. Tape seams shall overlap 25 mm. Adhesive shall extend onto the adjoining insulation not less than 50 mm. The total dry film thickness shall be not less than 1.6 mm (1/16 inch).
- d. Insulation terminations shall be tapered to unions at a 45-degree angle.
- e. At the option of the Contractor, factory premolded one- or two-piece PVC fitting covers may be used in lieu of the adhesive and embedded glass tape. Factory premolded segments or factory or field cut blanket insert insulation segments shall be used under the cover and shall be the same thickness as adjoining pipe insulation. The covers shall be secured by PVC vapor barrier tape, adhesive, seal-welding or with tacks made for securing PVC covers.

3.2.3 Piping Exposed to Weather

Piping exposed to weather shall be insulated and jacketed as specified for the applicable service inside the building. After this procedure, an aluminum jacket shall be applied. PVC jacketing requires no factory applied jacket beneath it.

3.2.3.1 Aluminum Jacket

The jacket for hot piping may be factory applied. The jacket shall overlap not less than 50 mm at longitudinal and circumferential joints and shall be secured with bands at not more than 300 mm centers. Longitudinal joints shall be overlapped down to shed water and located at 4 or 8 o'clock positions. Joints on piping 16 degrees C and below shall be sealed with caulking while overlapping to prevent moisture penetration. Where jacketing on piping 16 degrees C and below abuts an uninsulated surface, joints shall be caulked to prevent moisture penetration. Joints on piping above 16 degrees C shall be sealed with a moisture barrier.

3.2.3.2 Insulation for Fittings

Flanges, unions, valves, fittings, and accessories shall be insulated and finished as specified for the applicable service. Two coats of an emulsion type weatherproof mastic recommended by the insulation manufacturer shall be applied with glass tape embedded between coats. Tape overlaps shall be not less than 25 mm and the adjoining aluminum jacket not less than 50 mm.

Factory preformed aluminum jackets may be used in lieu of the above. Molded PVC fitting covers shall be used with PVC lagging and adhesive welded moisture tight.

3.2.3.3 PVC Lagging

PVC lagging shall be ultraviolet resistant and adhesive welded vapor tight with manufacturer's recommended adhesive. Installation shall include provision for thermal expansion.

3.2.4 Belowground Pipe Insulation

The following shall be included:

- a. Steam.
- b. Condensate.

3.2.4.1 Type of Insulation

Belowground pipe shall be insulated with 75 mm (3 inch) cellular glass insulation set in a coat of bedding compound as recommended by the manufacturer.

3.2.4.2 Installation of Belowground Pipe Insulation

- a. Bore surfaces of the insulation shall be coated with a thin coat of gypsum cement of a type recommended by the insulation manufacturer. Coating thickness shall be sufficient to fill surface cells of insulation. Mastic type materials shall not be permitted for this coating.
- b. Insulation applied to the pipe shall have joints tightly butted and bedded together with bedding compound as recommended by the

manufacturer. Butt joints shall be staggered.

- c. Stainless steel bands, 19 mm wide by 0.5080 mm (3/4 inch wide by 0.020 inch) thick shall be used to secure insulation in place. A minimum of two bands per section of insulation shall be applied. As an alternate, fiberglass reinforced tape may be used to secure insulation on piping up to 300 mm (12 inches) in diameter. A minimum of two bands per section of insulation shall be applied.
- d. Insulation shall terminate at anchor blocks but shall be continuous through sleeves and manholes.
- e. At point of entry to buildings, underground insulation shall be terminated 50 mm inside the wall or floor, shall butt tightly against the aboveground insulation and the butt joint shall be sealed with vapor barrier coating.
- f. Provision for expansion and contraction shall be made in accordance with the insulation manufacturer's recommendations.
- g. Flanges, couplings, valves, and fittings shall be insulated with factory premolded, prefabricated, or field-fabricated sections of insulation of the same material and thickness as the adjoining pipe insulation. Insulation sections shall be secured in place with wire, bore surfaces coated, and joints sealed as specified.
- h. Insulation, including fittings, shall be finished with three coats asphaltic mastic, with 10 by 10 glass mesh reinforcing fabric embedded between coats. Fabric shall be overlapped a minimum of 50 mm at joints. Total film thickness shall be a minimum of 4.7 mm (3/16 inch). As an alternate, a prefabricated bituminous laminated jacket, reinforced with 10 by 10-glass fiber mesh, shall be applied to the insulation. Jacketing material and application procedures shall match manufacturer's written instructions.
- i. At termination points, other than building entrances, the mastic and cloth or tape shall cover the ends of insulation and extend 50 mm along the bare pipe.

3.3 DUCT INSULATION INSTALLATION

Corner angles shall be installed on external corners of insulation on ductwork in exposed finished spaces before covering with jacket. Duct insulation shall be omitted on the following:

- a. Exposed supply and return ducts in air conditioned spaces unless otherwise shown. Air conditioned spaces shall be defined as those spaces directly supplied with conditioned air, hot or cold, or provided with a cooling or heating device such as a fan-coil unit.
- b. Factory preinsulated flexible ducts.
- c. Exhaust air ducts unless noted.

3.3.1 Insulation for Warm Air Duct

For warm air ducts above 16 degrees C , ducts and associated equipment shall be insulated to a thickness of 50 mm (2 inches)

except relief ducts and fresh air intake ducts which shall be 38 mm (1-1/2 inches). The following shall be insulated:

- a. Supply ducts.
- b. Return air ducts.
- c. Relief air ducts.
- e. Plenums.
- d. Filter boxes.
- e. Mixing boxes.
- f. Supply fans.

Insulation for rectangular ducts shall be flexible type where concealed, minimum density 12 kg per cubic meter (3/4 pcf); and rigid type where exposed, minimum density 48 kg per cubic meter (3 pcf). Insulation on exposed ducts shall be provided with a white, paintable, factory-applied Type II jacket, or finished with Class 1 adhesive finish. Flexible type insulation shall be used for round ducts, minimum density 12 kg per cubic meter (3/4 pcf) with a factory-applied Type II jacket. Insulation on concealed duct shall be provided with a factory-applied Type II jacket. Class 1 adhesive finish where indicated to be used shall be accomplished by applying two coats of Class 1 adhesive with a layer of glass cloth embedded between the coats. The total dry film thickness shall be approximately 1.6 mm (1/16 inch). Duct insulation shall be continuous through sleeves and prepared openings. Duct insulation shall terminate at fire dampers and flexible connections.

3.3.1.1 Installation on Exposed Duct

- a. For rectangular ducts, the rigid insulation shall be secured to the duct by the use of mechanical fasteners on all four sides of the duct, spaced not more than 300 mm apart and not more than 75 mm from the edges of the insulation joints. A minimum of two rows of fasteners shall be provided for each side of duct 300 mm and larger and a minimum of one row for each side of duct less than 300 mm.
- b. Duct insulation with factory-applied jacket shall be formed with minimum jacket seams, and each piece of rigid insulation shall be fastened to the duct using mechanical fasteners. Insulation shall be brought up to standing seams, reinforcing, and other vertical projections and shall not be carried over the projection. Jacket shall be continuous across seams, reinforcing, and projections. Where height of projections is greater than the insulation thickness, insulation and jacket shall be carried over the projection.
- c. Insulation shall be impaled on the fasteners; self-locking washers shall be installed and pin excess

clipped and bent over.

- d. Joints on jacketed insulation shall be sealed with a 100 mm (4 inch) wide strip of the same material as the jacket. The strip shall be secured with Class 2 adhesive and stapled.
- e. Breaks and penetrations in the jacket material shall be covered with a patch of the same material as the jacket. Patches shall extend not less than 50 mm beyond the break or penetration and shall be secured with Class 2 adhesive and stapled.
- f. Insulation terminations and pin punctures shall be sealed and flashed with a Class 1 adhesive. Two coats of Class 1 adhesive coating shall be applied with glass cloth embedded between coats. The total coating shall have a dry film thickness of approximately 1.6 mm (1/16 inch) and shall overlap the adjoining insulation and uninsulated surface 50 mm.
- g. Oval and round ducts, flexible type, shall be insulated with factory Type I jacket insulation, minimum density of 12 kg per cubic meter (3/4 pcf) attached by applying Class 2 adhesive around the entire perimeter of the duct in 150 mm wide stripe on 300 mm center. Joints shall be sealed with a 100 mm (4 inch) wide strip of the same material as the jacket. The strip shall be secured with Class 2 adhesive and stapled.

3.3.2 Duct Test Holes

After duct systems have been tested, adjusted, and balanced, breaks in the insulation and jacket shall be repaired in accordance with the applicable section of this specification for the type of duct insulation to be repaired.

3.4 EQUIPMENT INSULATION INSTALLATION

3.4.1 General

Removable insulation sections shall be provided to cover parts of equipment which must be opened periodically for maintenance including vessel covers, fasteners, flanges and accessories. Equipment insulation shall be omitted on the following:

- a. Handholes.
- b. Cleanouts.
- c. ASME stamps.
- d. Manufacturer's nameplates.

3.4.2 Insulation for Hot Equipment

Hot equipment above 16 degrees C: Insulation shall be furnished on equipment handling media above 16 degrees C including the following:

- a. Pumps handling media above 54 degrees C.
- b. Condensate receivers.

3.4.2.1 Insulation

Insulation shall be suitable for the temperature encountered.
Insulation thicknesses shall be as follows:

- a. Equipment handling steam to 103.4 kPa (15 psig) or other media to 121 degrees C (250 degrees F): 50.8 mm (2 inch) thick material.
- b. Equipment handling media to 316 degrees C (600 degrees F): 150 mm (6 inch) thick material.

3.4.2.2 Other Equipment

- a. Insulation shall be formed or fabricated to fit the equipment. To ensure a tight fit on round equipment, edges shall be beveled and joints shall be tightly butted and staggered.
- b. Insulation shall be secured in place with bands or wires at intervals as recommended by the manufacturer but not greater than 300 mm centers except flexible cellular which shall be adhered. Insulation corners shall be protected under wires and bands with suitable corner angles.
- c. Cellular glass insulation shall be set in a coating of bedding compound as recommended by the manufacturer, and joints shall be sealed with bedding compound. Mineral fiber joints shall be filled with finishing cement.
- d. Exposed insulation corners shall be protected with corner angles.
- e. Upon completion of installation of insulation, penetrations shall be caulked. Two coats of Class I adhesive shall be applied over insulation, including removable sections, with a layer of glass cloth embedded between the coats. The total dry thickness of the finish shall be 1.6 mm (1/16 inch). Caulking shall be applied to parting line between equipment and removable section insulation.

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SECTION 15330

WET PIPE SPRINKLER SYSTEM, FIRE PROTECTION

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 47	(1990) Ferritic Malleable Iron Castings
ASTM A 53	(1995a) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
ASTM A 135	(1993) Electric-Resistance-Welded Steel Pipe
ASTM A 183	(1983; R 1990) Carbon Steel Tract Bolts and Nuts
ASTM A 536	(1984; R 1993) Ductile Iron Castings
ASTM A 795	(1995) Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use
ASTM B 88	(1995a) Seamless Copper Water Tube
ASTM D 3309	(1994) Polybutylene (PB) Plastic Hot-and Cold-Water Distribution Systems
ASTM F 442	(1994) Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe (SDR-PR)

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B16.1	(1989) Cast Iron Pipe Flanges and Flanged Fittings
ASME B16.3	(1992) Malleable Iron Threaded Fittings
ASME B16.4	(1992) Cast Iron Threaded Fittings
ASME B16.9	(1993) Factory-Made Wrought Steel Buttwelding Fittings
ASME B16.11	(1991) Forged Fittings, Socket-Welding and Threaded
ASME B16.18	(1984; R 1994) Cast Copper Alloy Solder Joint Pressure Fittings

ASME B16.21	(1992) Nonmetallic Flat Gaskets for Pipe Flanges
ASME B16.22	(1995) Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
ASME B18.2.1	(1981; Supple 1991; R 1992) Square and Hex Bolts and Screws (Inch Series)
ASME B18.2.2	(1987; R 1993) Square and Hex Nuts (Inch Series)

AMERICAN SOCIETY OF SANITARY ENGINEERING (ASSE)

ASSE 1015	(1993) Double Check Backflow Prevention Assembly
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AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA-10062JU	(1992) Standard Methods for the Examination of Water and Wastewater
AWWA B300	(1992) Hypochlorites
AWWA B301	(1992) Liquid Chlorine
AWWA C104	(1990) Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
AWWA C110	(1993) Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In. (75 mm through 1200 mm), for Water and Other Liquids
AWWA C111	(1990) Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
AWWA C151	(1991) Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids
AWWA C203	(1991) Coal-Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape - Hot-Applied
AWWA M20	(1973) Manual: Water Chlorination Principles and Practices

FACTORY MUTUAL ENGINEERING AND RESEARCH (FM)

FM P7825	(1995; Supple I; Supple II; Supple III) Approval Guide
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MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

MSS SP-71	(1990) Cast Iron Swing Check Valves, Flanges and Threaded Ends
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NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 13	(1994) Installation of Sprinkler Systems
NFPA 13R	(1994) Installation of Sprinkler Systems in Residential Occupancies Up to and Including Four Stories in Height
NFPA 24	(1995) Installation of Private Fire Service Mains and Their Appurtenances
NFPA 231C	(1995) Rack Storage of Materials
NFPA 1963	(1993) Fire Hose Connections

NATIONAL INSTITUTE FOR CERTIFICATION IN ENGINEERING TECHNOLOGIES
(NICET)

NICET 1014	(1995) Program Detail Manual for Certification in the Field of Fire Protection Engineering Technology (Field Code 003) Automatic Sprinkler System Layout
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UNDERWRITERS LABORATORIES (UL)

UL-01	(1996) Building Materials Directory
UL-04	(1996; Supple) Fire Protection Equipment Directory
UL 668	(1989; Rev Feb 1994) Hose Valves For Fire Protection Service

1.2 GENERAL REQUIREMENTS

Wet pipe sprinkler system shall be provided in all areas of the building . The sprinkler system shall provide fire sprinkler protection for the entire area. Except as modified herein, the system shall be designed and installed in accordance with NFPA 13. Pipe sizes which are not indicated on drawings shall be determined by hydraulic calculation.

1.2.1 Hydraulic Design

The system shall be hydraulically designed to discharge a minimum density shall be as indicated on the drawings over the hydraulically most demanding 360 square meters of floor area. The minimum pipe size for branch lines in gridded systems shall be 32 mm (1-1/4 inch). Hydraulic calculations shall be in accordance with the Area/Density Method of NFPA 13.

1.2.1.1 Hose Demand

An allowance for exterior hose streams of 960 L/min shall be added to the sprinkler system demand at the fire hydrant shown on the drawings closest to the point where the water service enters the building

1.2.1.2 Basis for Calculations

The design of the system shall be based upon a water supply as indicated on the drawings Water supply shall be presumed available at the base of the

riser. Hydraulic calculations shall be based upon the Hazen-Williams formula with a "C" value of 120 for steel piping, 150 for copper tubing, 140 for new cement-lined ductile-iron piping, and 100 for existing underground piping.

1.2.2 Sprinkler Spacing

Sprinklers shall be uniformly spaced on branch lines. Maximum spacing per sprinkler shall not exceed limits specified in NFPA 13 for ordinary hazard occupancy.

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. Submittals related to system configuration, hydraulic calculations, and equipment selection, including manufacturer's catalog data, working drawings, connection drawings, control diagrams and certificates shall be submitted concurrently as a complete package. The package will be reviewed by the U.S. Army Engineer District Fire Protection Engineer. The following shall be submitted in accordance with Section 01300 SUBMITTAL PROCEDURES:

SD-01 Data

Load Calculations for Sizing Sway Bracing

For systems that are required to be protected against damage from earthquakes, load calculations shall be provided for sizing of sway bracing.

Sprinkler System Equipment; FIO.

Manufacturer's Catalog Data for each separate piece of equipment proposed for use in the system. Data shall indicate the name of the manufacturer of each item of equipment, with data highlighted to indicate model, size, options, etc. proposed for installation. In addition, a complete equipment list which includes equipment description, model number and quantity shall be provided.

Hydraulic Calculations; FIO.

Hydraulic calculations, including a drawing showing hydraulic reference points and pipe segments.

Spare Parts; FIO.

Spare parts data shall be included for each different item of material and equipment specified. The data shall include a complete list of parts and supplies, with current unit prices and source of supply, and a list of parts recommended by the manufacturer to be replaced after 1 year and 3 years of service. A list of special tools and test equipment required for maintenance and testing of the products supplied by the Contractor shall be included.

SD-04 Drawings

Sprinkler System Shop Drawings; FIO.

Detail drawings conforming to the requirements established for working plans as prescribed in NFPA 13. Drawings shall include plan and elevation

views which establish that the equipment will fit the allotted spaces with clearance for installation and maintenance. Each set of drawings shall include the following:

- a. Descriptive index of drawings in the submittal with drawings listed in sequence by drawing number. A legend identifying device symbols, nomenclature, and conventions used.
- b. Floor plans drawn to a scale not less than 1:100 which clearly show locations of sprinklers, risers, pipe hangers, seismic separation assemblies, sway bracing, inspector's test connections, drains, and other applicable details necessary to clearly describe the proposed arrangement. Each type of fitting used and the locations of bushings, reducing couplings, and welded joints shall be indicated.
- c. Actual center-to-center dimensions between sprinklers on branch lines and between branch lines; from end sprinklers to adjacent walls; from walls to branch lines; from sprinkler feed mains, cross-mains and branch lines to finished floor and roof or ceiling. A detail shall show the dimension from the sprinkler and sprinkler deflector to the ceiling in finished areas.
- d. Longitudinal and transverse building sections showing typical branch line and cross-main pipe routing as well as elevation of each typical sprinkler above finished floor.
- e. Details of each type of riser assembly; pipe hanger; sway bracing for earthquake protection, and restraint of underground water main at point-of-entry into the building, and electrical devices and interconnecting wiring.

As-Built Drawings; FIO.

As-built drawings, no later than 14 working days after completion of the Final Tests. The sprinkler system shop drawings shall be updated to reflect as-built conditions after work is completed and shall be on reproducible full-size mylar film.

SD-06 Instructions

Test Procedures; FIO.

Proposed test procedures for piping hydrostatic test, testing of alarms, at least 14 days prior to the start of related testing.

SD-07 Schedules

Preliminary Tests; FIO.

A schedule of preliminary tests, at least 14 days prior to the proposed start of the tests.

Final Test; FIO.

Upon successful completion of tests specified under PRELIMINARY TESTS, written notification shall be given to the Contracting Officer of the date for the final acceptance test. Notification shall be provided at least 14 days prior to the proposed start of the test. Notification shall include a

copy of the Contractor's Material & Test Certificates.

SD-08 Statements

Installer Qualifications; FIO.

Qualifications of the sprinkler installer.

Submittal Preparer's Qualifications; FIO.

The name and documentation of certification of the individual who will prepare the submittals, prior to the submittal of the drawings and hydraulic calculations.

SD-13 Certificates

Contractor's Material & Test Certificates; FIO.

Certificates, as specified in NFPA 13, shall be completed and signed by the Contractor's Representative performing required tests for both underground and aboveground piping.

SD-19 Operation and Maintenance Manuals

Sprinkler System; FIO.

Manuals shall be in loose-leaf binder format and grouped by technical sections consisting of manufacturer's standard brochures, schematics, printed instructions, general operating procedures, and safety precautions. The manuals shall list routine maintenance procedures possible breakdowns, and repairs, and troubleshooting guide. This shall include procedures and instructions pertaining to frequency of preventive maintenance, inspection, adjustment, lubrication and cleaning necessary to minimize corrective maintenance and repair.

1.4 HYDRAULIC CALCULATIONS

Hydraulic calculations shall be as outlined in NFPA 13 except that calculations shall be performed by computer using software specifically designed for fire protection system design. Software which uses k-factors for typical branch lines is not acceptable. Calculations shall be taken back to the water supply source unless water supply data is otherwise indicated. Calculations shall substantiate that the design area indicated is the hydraulically most demanding. Water supply curves and system requirements shall be plotted on semi-logarithmic graph paper so as to present a summary of the complete hydraulic calculation. A summary sheet listing sprinklers in the design area and their respective hydraulic reference points, elevations, actual discharge pressures and actual flows shall be provided. Elevations of hydraulic reference points (nodes) shall be indicated. Documentation shall identify each pipe individually and the nodes connected thereto. The diameter, length, flow, velocity, friction loss, number and type fittings, total friction loss in the pipe, equivalent pipe length and Hazen-Williams coefficient shall be indicated for each pipe. For gridded systems, calculations shall show peaking of demand area friction loss to verify that the hydraulically most demanding area is being used. Also for gridded systems, a flow diagram indicating the quantity and direction of flows shall be included. A drawing showing hydraulic reference points (nodes) and pipe designations used in the calculations shall be included and shall be independent of shop drawings.

1.5 SUBMITTAL PREPARER'S QUALIFICATIONS

The sprinkler system submittals, including as-built drawings, shall be prepared by an individual who is either a registered professional engineer or who is certified as a Level [III] [IV] Technician by National Institute for Certification in Engineering Technologies (NICET) in the Automatic Sprinkler System Layout subfield of Fire Protection Engineering Technology in accordance with NICET 1014.

1.6 INSTALLER QUALIFICATIONS

The installer shall be experienced and regularly engaged in the installation of the type and complexity of system included in this project. A statement prior to submittal of any other data or drawings, that the proposed sprinkler system installer is regularly engaged in the installation of the type and complexity of system included in this project shall be provided. In addition, data identifying the location of at least three systems recently installed by the proposed installer which are comparable to the system specified shall be submitted. Contractor shall certify that each system has performed satisfactorily, in the manner intended, for a period of not less than 6 months.

1.7 REGULATORY REQUIREMENTS

Compliance with referenced NFPA standards is mandatory. This includes advisory provisions listed in the appendices of such standards, as though the word "shall" had been substituted for the word "should" wherever it appears. Applicable material and installation standards referenced in Appendix A of NFPA 13 and NFPA 24 shall be considered mandatory the same as if such referenced standards were specifically listed in this specification. In the event of a conflict between specific provisions of this specification and applicable NFPA standards, this specification shall govern. All requirements that exceed the minimum requirements of NFPA 13 shall be incorporated into the design. Reference to "authority having jurisdiction" shall be interpreted to mean the Contracting Officer.

1.8 DELIVERY AND STORAGE

Equipment placed in storage shall be stored with protection from the weather, humidity and temperature variations, dirt and dust or other contaminants.

PART 2 PRODUCTS

2.1 GENERAL EQUIPMENT REQUIREMENTS

2.1.1 Standard Products

Materials and equipment shall be standard products of a manufacturer regularly engaged in the manufacture of such products and shall essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening.

2.1.2 Requirements for Fire Protection Service

Equipment and materials shall have been tested by Underwriters Laboratories, Inc. and listed in UL-04 or approved by Factory Mutual and listed in FM P7825. Where the terms "listed" or "approved" appear in this

specification, such shall mean listed in UL-04 or FM P7825.

2.1.3 Nameplates

Major components of equipment shall have the manufacturer's name, address, type or style, model or serial number, and catalog number on a plate permanently affixed to the item of equipment.

2.2 UNDERGROUND PIPING SYSTEMS

2.2.1 Pipe

Piping from a point 150 mm above the floor to a point 1500 mm outside the building wall shall be ductile iron with a rated working pressure of 1034 kPa [150 psi] conforming to AWWA C151, with cement mortar lining conforming to AWWA C104. Piping more than 1500 mm outside the building walls shall comply with Section 02660 WATER LINES.

2.2.2 Fittings and Gaskets

Fittings shall be ductile iron conforming to AWWA C110. Gaskets shall be suitable in design and size for the pipe with which such gaskets are to be used. Gaskets for ductile iron pipe joints shall conform to AWWA C111.

2.2.3 Gate Valve and Indicator Posts

Gate valves for underground installation shall be of the inside screw type with counter-clockwise rotation to open. Where indicating type valves are shown or required, indicating valves shall be gate valves with an approved indicator post of a length to permit the top of the post to be located 900 mm above finished grade. Gate valves and indicator posts shall be listed in UL-04 or FM P7825.

2.3 ABOVEGROUND PIPING SYSTEMS

Aboveground piping shall be steel or copper.

2.3.1 Steel Piping System

2.3.1.1 Steel Pipe

Except as modified herein, steel pipe shall be black as permitted by NFPA 13 and shall conform to applicable provisions of ASTM A 795, ASTM A 53, or ASTM A 135. Pipe in which threads or grooves are cut shall be Schedule 40 or shall be listed by Underwriters' Laboratories to have a corrosion resistance ratio (CRR) of 1.0 or greater after threads or grooves are cut. Pipe shall be marked with the name of the manufacturer, kind of pipe, and ASTM designation.

2.3.1.2 Fittings for Non-Grooved Steel Pipe

Fittings shall be cast iron conforming to ASME B16.4, steel conforming to ASME B16.9 or ASME B16.11, or malleable iron conforming to ASME B16.3. Steel press fittings shall be approved for fire protection systems. Galvanized fittings shall be used for piping systems or portions of piping systems utilizing galvanized piping. Fittings into which sprinklers, drop nipples or riser nipples (sprigs) are screwed shall be threaded type. Plain-end fittings with mechanical couplings, fittings which use steel gripping devices to bite into the pipe and segmented welded fittings shall

not be used.

2.3.1.3 Grooved Mechanical Joints and Fittings

Joints and fittings shall be designed for not less than 1200 kPa (175 psi) service and shall be the product of the same manufacturer. Fitting and coupling houses shall be malleable iron conforming to ASTM A 47, Grade 32510; ductile iron conforming to ASTM A 536, Grade 65-45-12. Gasket shall be the flush type that fills the entire cavity between the fitting and the pipe. Nuts and bolts shall be heat-treated steel conforming to ASTM A 183 and shall be cadmium plated or zinc electroplated.

2.3.1.4 Flanges

Flanges shall conform to NFPA 13 and ASME B16.1. Gaskets shall be non-asbestos compressed material in accordance with ASME B16.21, 1.6 mm (1/16 inch) thick, and full face or self-centering flat ring type. Bolts shall be squarehead conforming to ASME B18.2.1 and nuts shall be hexagon type conforming to ASME B18.2.2.

2.3.2 Copper Tube Systems

2.3.2.1 Copper Tube

Copper tube shall conform to ASTM B 88, Types L and M.

2.3.2.2 Copper Fittings

Cast copper alloy pressure fittings shall conform to ASME B16.18 and wrought copper and bronze pressure fittings shall conform to ASME B16.22.

2.3.3 Pipe Hangers

Hangers shall be listed in UL-04 or FM P7825 and of the type suitable for the application, construction, and pipe type and sized involved.

2.3.4 Valves

2.3.4.1 Control Valve and Gate Valve

Manually operated sprinkler control valve and gate valve shall be outside stem and yoke (OS&Y) type and shall be listed in UL-01 or FM P7825.

2.3.4.2 Check Valve

Check valve 50 mm (2 inches) and larger shall be listed in UL-01 or FM P7825. Check valves 100 mm (4 inches) and larger shall be of the swing type with flanged cast iron body and flanged inspection plates, shall have a clear waterway and shall meet the requirements of MSS SP-71, for Type 3 or 4.

2.3.4.3 Hose Valve

Valve shall comply with UL 668 and shall have a minimum rating of 2070 kPa (300 psi). Valve shall be non-rising stem, all bronze, 90 degree angle type, with 65 mm (2-1/2 inch) American National Standard Fire Hose Screw Thread (NH) male outlet in accordance with NFPA 1963. Hose valve shall be provided with 65 mm to 40 mm (2-1/2 inch to 1-1/2 inch) reducer. Hose valves shall be equipped with lugged cap with drip drain, cap gasket and

chain. Valve finish shall be rough chrome plated.

2.4 ALARM INITIATING AND SUPERVISORY DEVICES

2.4.1 Sprinkler Waterflow Indicator Switch, Vane Type

Switch shall be vane type with a pipe saddle and cast aluminum housing. The electro-mechanical device shall include a flexible, low-density polyethylene paddle conforming to the inside diameter of the fire protection pipe. The device shall sense water movements and be capable of detecting a sustained flow of 38 L/min (10 gpm) or greater. The device shall contain a retard device adjustable from 0 to 90 seconds to reduce the possibility of false alarms caused by transient flow surges. The switch shall include two SPDT (Form C) contacts, and shall be equipped with a silicone rubber gasket to assure positive water seal and a dustproof cover and gasket to seal the mechanism from dirt and moisture.

2.4.2 Sprinkler Pressure (Waterflow) Alarm Switch

Pressure switch shall include a metal housing with a neoprene diaphragm, SPDT snap action switches and a 15 mm (1/2 inch) NPT male pipe thread. The switch shall have a maximum service pressure rating of 1207 kPa (175 psi). There shall be two SPDT (Form C) contacts factory adjusted to operate at 28 to 55 kPa. The switch shall be capable of being mounted in any position in the alarm line trim piping of the alarm check valve.

2.4.3 Valve Supervisory (Tamper) Switch

Switch shall be suitable for mounting to the type of control valve to be supervised open. The switch shall be tamper resistant and contain one set of SPDT (Form C) contacts arranged to transfer upon removal of the housing cover or closure of the valve of more than two rotations of the valve stem.

2.5 FIRE DEPARTMENT CONNECTION

Fire department connection shall be projectin type with cast brass body, matching wall escutcheon lettered "Auto Spkr" with a polished brass finish. The connection shall have two inlets with individual self-closing clappers, caps with drip drains and chains. Female inlets shall have 65 mm (2-1/2 inch) diameter American National Fire Hose Connection Screw Threads (NH) per NFPA 1963.

2.6 SPRINKLERS

Sprinklers shall be used in accordance with their listed spacing limitations. Temperature classification shall be ordinary

2.6.1 Pendent Sprinkler

Pendent sprinkler shall be of the fusible strut type, quick-response type with nominal 13.5 mm (17/32 inch) orifice. Pendent sprinklers shall be brass finish.

2.7 DISINFECTING MATERIALS

2.7.1 Liquid Chlorine

Liquid chlorine shall conform to AWWA B301.

2.7.2 Hypochlorites

Calcium hypochlorite and sodium hypochlorite shall conform to AWWA B300.

2.8 ACCESSORIES

2.8.1 Sprinkler Cabinet

Spare sprinklers shall be provided in accordance with NFPA 13 and shall be packed in a suitable metal or plastic cabinet. Spare sprinklers shall be representative of, and in proportion to, the number of each type and temperature rating of the sprinklers installed. At least one wrench of each type required shall be provided.

2.8.2 Pipe Escutcheon

Escutcheon shall be polished chromium-plated zinc alloy, or polished chromium-plated copper alloy. Escutcheons shall be either one-piece or split-pattern, held in place by internal spring tension or set screw.

2.8.3 Identification Sign

Valve identification sign shall be minimum 150 mm wide x 50 mm high with enamel baked finish on minimum 1.214 mm (18 gauge) steel or 0.6 mm (0.024 inch) aluminum with red letters on a white background or white letters on red background. Wording of sign shall include, but not be limited to "main drain," "auxiliary drain," "inspector's test," "alarm test," "alarm line," and similar wording as required to identify operational components.

2.9 DOUBLE-CHECK VALVE BACKFLOW PREVENTION ASSEMBLY

Double-check backflow prevention assembly shall comply with ASSE 1015. The assembly shall have a bronze, cast-iron or stainless steel body with flanged ends. The assembly shall include OS&Y shutoff valves on the inlet and outlet, 2-positive-seating check valve for continuous pressure application, and four test cocks. Assemblies shall be rated for working pressure of 1034 kPa. The maximum pressure loss shall be 40 kPa at a flow rate equal to the sprinkler water demand, at the location of the assembly.

PART 3 EXECUTION

3.1 INSTALLATION REQUIREMENTS

The installation shall be in accordance with the applicable provisions of NFPA 13, NFPA 24 and publications referenced therein.

3.2 ABOVEGROUND PIPING INSTALLATION

Piping shall be run straight and bear evenly on hangers and supports.

3.2.1 Protection of Piping Against Earthquake Damage

The system piping shall be protected against damage from earthquakes. Seismic protection of the piping system shall be provided in accordance with NFPA 13 and Appendix A, with the exception that the "Earthquake Zones" map of Appendix A shall not apply to this project. Seismic protection shall include flexible couplings, sway bracing, seismic separation assemblies where piping crosses building seismic separation joints, and other features as required in NFPA 13 for protection of piping against

damage from earthquakes. Branch lines shall be equipped with sway braces at the end sprinkler head and at intervals not exceeding 9 m.

3.2.2 Piping in Exposed Areas

Exposed piping shall be installed so as not to diminish exit access widths, corridors or equipment access. Exposed horizontal piping, including drain piping, shall be installed to provide maximum headroom.

3.2.3 Pendent Sprinklers

Drop nipples to pendent sprinklers shall consist of minimum 25 mm (1 inch) pipe with a reducing coupling into which the sprinkler shall be threaded. Hangers shall be provided on arm-overs to drop nipples supplying pendent sprinklers when the arm-over exceeds 300 mm.

3.2.3.1 Pipe Joints

Pipe joints shall conform to NFPA 13, except as modified herein. Not more than four threads shall show after joint is made up. Welded joints will be permitted, only if welding operations are performed as required by NFPA 13 at the Contractor's fabrication shop, not at the project construction site.

Flanged joints shall be provided where indicated or required by NFPA 13. Grooved pipe and fittings shall be prepared in accordance with the manufacturer's latest published specification according to pipe material, wall thickness and size. Grooved couplings and fittings shall be from the same manufacturer.

3.2.3.2 Reducers

Reductions in pipe sizes shall be made with one-piece tapered reducing fittings. The use of grooved-end or rubber-gasketed reducing couplings will not be permitted. When standard fittings of the required size are not manufactured, single bushings of the face type will be permitted. Where used, face bushings shall be installed with the outer face flush with the face of the fitting opening being reduced. Bushings shall not be used in elbow fittings, in more than one outlet of a tee, in more than two outlets of a cross, or where the reduction in size is less than 15 mm (1/2 inch).

3.2.3.3 Pipe Penetrations

Cutting structural members for passage of pipes or for pipe-hanger fastenings will not be permitted. Pipes that must penetrate concrete or masonry walls or concrete floors shall be core-drilled and provided with pipe sleeves. Each sleeve shall be Schedule 40 galvanized steel, ductile iron or cast iron pipe and shall extend through its respective wall or floor and be cut flush with each wall surface. Sleeves shall provide required clearance between the pipe and the sleeve per NFPA 13. The space between the sleeve and the pipe shall be firmly packed with mineral wool insulation. Where pipes pass through fire walls, fire partitions, or floors, a fire seal shall be placed between the pipe and sleeve in accordance with Section 07270 FIRESTOPPING. In penetrations which are not fire-rated or not a floor penetration, the space between the sleeve and the pipe shall be sealed at both ends with plastic waterproof cement which will dry to a firm but pliable mass or with a mechanically adjustable segmented elastomer seal.

3.2.3.4 Escutcheons

Escutcheons shall be provided for pipe penetration of ceilings and walls. Escutcheons shall be securely fastened to the pipe at surfaces through which piping passes.

3.2.3.5 Inspector's Test Connection

Unless otherwise indicated, test connection shall consist of 25 mm (1 inch) pipe connected to the remote branch line; a test valve located approximately 2 meters above the floor; a smooth bore brass outlet equivalent to the smallest orifice sprinkler used in the system; and a painted metal identification sign affixed to the valve with the words "Inspector's Test." The discharge orifice shall be located outside the building wall directed so as not to cause damage to adjacent construction or landscaping during full flow discharge.

3.2.3.6 Drains

Main drain piping shall be provided to discharge at the location indicated. Auxiliary drains shall be provided as required by NFPA 13 except that drain valves shall be used where drain plugs are otherwise permitted. Where branch lines terminate at low points and form trapped sections, such branch lines shall be manifolded to a common drain line.

3.2.3.7 Installation of Fire Department Connection

Connection shall be mounted as shown. The piping between the connection and the check valve shall be provided with an automatic drip in accordance with NFPA 13 and arranged to drain to the outside.

3.2.3.8 Identification Signs

Signs shall be affixed to each control valve, inspector test valve, main drain, auxiliary drain, test valve, and similar valves as appropriate or as required by NFPA 13. Hydraulic design data nameplates shall be permanently affixed to each sprinkler riser as specified in NFPA 13.

3.2.4 UNDERGROUND PIPING INSTALLATION

The fire protection water main shall be laid, and joints anchored, in accordance with NFPA 24. Minimum depth of cover shall be 900 mm. The supply line shall terminate inside the building with a flanged piece, the bottom of which shall be set not less than 150 mm above the finished floor. A blind flange shall be installed temporarily on top of the flanged piece to prevent the entrance of foreign matter into the supply line. A concrete thrust block shall be provided at the elbow where the pipe turns up toward the floor. In addition, joints shall be anchored in accordance with NFPA 24 using pipe clamps and steel rods from the elbow to the flange above the floor and from the elbow to a pipe clamp in the horizontal run of pipe. Buried steel components shall be provided with a corrosion protective coating in accordance with AWWA C203. Piping more than 1500 mm outside the building walls shall meet the requirements of Section 02660 WATER LINES.

3.2.5 EARTHWORK

Earthwork shall be performed in accordance with applicable provisions of Section 02221 EXCAVATION, FILLING AND BACKFILLING FOR BUILDINGS.

3.2.6 ELECTRICAL WORK

Alarm signal wiring connected to the building fire alarm control system shall be in accordance with Section 16721 FIRE DETECTION AND ALARM SYSTEM. Wiring color code shall remain uniform throughout the system.

3.2.7 STERILIZATION

After system components have been installed and pressure tested, each portion of the completed system shall be sterilized. After pressure tests have been made, the portion to be sterilized shall be thoroughly flushed with water until all entrained dirt and other foreign materials have been removed before introducing chlorinating material. The chlorinating material shall be hypochlorites or liquid chlorine. Water chlorination procedure shall be in accordance with AWWA M20. The chlorinating material shall be fed into the sprinkler piping at a constant rate of 50 parts per million (ppm). A properly adjusted hypochlorite solution injected into the system with a hypochlorinator, or liquid chlorine injected into the system through a solution-fed chlorinator and booster pump, shall be used. Chlorination application shall continue until the entire system is filled. The water shall remain in the system for a minimum of 24 hours. Each valve in the system shall be opened and closed several times to ensure its proper disinfection. Following the 24-hour period, no less than 25 ppm chlorine residual shall remain in the system. The system shall be then flushed with clean water until the residual chlorine is reduced to less than one part per million. Samples of water in properly sterilized containers for bacterial examination will be taken from several system locations which are approved by the Contracting Officer. Samples shall be tested for total coliform organisms (coliform bacteria, fecal coliform, streptococcal, and other bacteria) in accordance with AWWA-10062JU. The testing method shall be either the multiple-tube fermentation technique or the membrane-filter technique. The sterilization shall be repeated until tests indicate the absence of coliform organisms (zero mean coliform density per 100 milliliters) in the samples for at least 2 full days. The system will not be accepted until satisfactory bacteriological results have been obtained.

3.2.8 FIELD PAINTING AND FINISHING

Field painting and finishing are specified in Section 09900 PAINTING, GENERAL.

3.2.9 PRELIMINARY TESTS

The system, including the underground water mains, and the aboveground piping and system components, shall be tested to assure that equipment and components function as intended. The underground and aboveground interior piping systems and attached appurtenances subjected to system working pressure shall be tested in accordance with NFPA 13 and NFPA 24. Upon completion of specified tests, the Contractor shall complete certificates as specified in paragraph SUBMITTALS.

3.2.9.1 Underground Piping

3.2.9.1.1 Flushing

Underground piping shall be flushed in accordance with NFPA 24. This includes the requirement to flush the lead-in connection to the fire protection system at a flow rate not less than the calculated maximum water demand rate of the system.

3.3 Hydrostatic Testing

New underground piping shall be hydrostatically tested in accordance with NFPA 24. The allowable leakage shall be measured at the specified test pressure by pumping from a calibrated container. The amount of leakage at the joints shall not exceed 1.89 liters (2 quarts) per hour per 100 gaskets or joints, regardless of pipe diameter.

3.4 Aboveground Piping

3.4.1 Hydrostatic Testing

Aboveground piping shall be hydrostatically tested in accordance with NFPA 13 at not less than 1400 kPa or 350 kPa in excess of maximum system operating pressure and shall maintain that pressure without loss for 2 hours. There shall be no drop in gauge pressure or visible leakage when the system is subjected to the hydrostatic test. The test pressure shall be read from a gauge located at the low elevation point of the system or portion being tested.

3.5 Testing of Alarm Devices

Each alarm switch shall be tested by flowing water through the inspector's test connection. Each water-operated alarm devices shall be tested to verify proper operation.

3.6 Main Drain Flow Test

Following flushing of the underground piping, a main drain test shall be made to verify the adequacy of the water supply. Static and residual pressures shall be recorded on the certificate specified in paragraph SUBMITTALS. In addition, a main drain test shall be conducted each time after a main control valve is shut and opened.

3.7 FINAL ACCEPTANCE TEST

A technician employed by the installing Contractor shall be present for the final tests and shall provide a complete demonstration of the operation of the system. This shall include operation of control valves and flowing of inspector's test connections to verify operation of associated waterflow alarm switches. After operation of control valves has been completed, the main drain test shall be repeated to assure that control valves are in the open position. In addition, the representative shall have available copies of as-built drawings and certificates of tests previously conducted. The installation shall not be considered accepted until identified discrepancies have been corrected and test documentation is properly completed and received.

-- End of Section --

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SECTION 15400

PLUMBING, GENERAL PURPOSE

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AIR CONDITIONING AND REFRIGERATION INSTITUTE (ARI)

ARI 700 (1993) Specifications for Fluorocarbon and Other Refrigerants

ARI 1010 (1994) Drinking-Fountains and Self-Contained, Mechanically-Refrigerated Drinking-Water Coolers

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z21.10.1 (1993; Z21.10.1a) Gas Water Heaters Vol. I Storage Water Heaters with Input Ratings of 75,000 Btu Per Hour or Less

ANSI Z21.10.3 (1993; Z21.10.3a) Gas Water Heaters Vol. III Storage, With Input Ratings Above 75,000 Btu Per Hour, Circulating and Instantaneous Water Heaters

ANSI Z21.22 (1986; Z21.22a) Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems

ANSI Z21.56 (1991; Z21.56a; Z21.56b) Gas-Fired Pool Heaters

ANSI Z124.1 (1987; Z124.1a; Z124.1b) Plastic Bathtub Units

ANSI Z124.3 (1987; Z124.3a) Plastic Lavatories

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 47 (1990) Ferritic Malleable Iron Castings

ASTM A 53 (1993a) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless

ASTM A 74 (1994) Cast Iron Soil Pipe and Fittings

ASTM A 105 (1995) Forgings, Carbon Steel, for Piping Components

ASTM A 183	(1983; R 1990) Carbon Steel Track Bolts and Nuts
ASTM A 193	(1996) Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service
ASTM A 515	(1992) Pressure Vessel Plates, Carbon Steel, for Intermediate- and Higher-Temperature Service
ASTM A 516	(1990) Pressure Vessel Plates, Carbon Steel, for Moderate- and Lower-Temperature Service
ASTM A 518	(1992) Corrosion-Resistant High-Silicon Iron Castings
ASTM A 536	(1984; R 1993) Ductile Iron Castings
ASTM A 733	(1993) Welded and Seamless Carbon Steel and Austenitic Stainless Steel Pipe Nipples
ASTM A 888	(1994) Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications
ASTM B 32	(1995) Solder Metal
ASTM B 42	(1993) Seamless Copper Pipe, Standard Sizes
ASTM B 43	(1994) Seamless Red Brass Pipe, Standard Sizes
ASTM B 75	(1993) Seamless Copper Tube
ASTM B 88	(1993a) Seamless Copper Water Tube
ASTM B 111	(1993) Copper and Copper-Alloy Seamless Condenser Tubes and Ferule Stock
ASTM B 117	(1994) Operating Salt Spray (Fog) Testing Apparatus
ASTM B 152	(1994) Copper Sheet, Strip, Plate, and Rolled Bar
ASTM B 306	(1992) Copper Drainage Tube (DWV)
ASTM B 370	(1992) Copper Sheet and Strip for Building Construction
ASTM B 584	(1993b) Copper Alloy Sand Castings for General Applications
ASTM B 641	(1993) Seamless and Welded Copper Distribution Tube (Type D)
ASTM B 813	(1993) Liquid and Paste Fluxes for

Soldering Applications of Copper and Copper Alloy Tube

ASTM B 828	(1992) Making Capillary Joints by Soldering of Copper and Copper-Alloy Tube & Fittings
ASTM C 564	(1994a) Rubber Gaskets for Cast Iron Soil Pipe and Fittings
ASTM C 920	(1987) Elastomeric Joint Sealants
ASTM C 1053	(1990) Borosilicate Glass Pipe and Fittings for Drain, Waste, and Vent (DWV) Applications
ASTM D 638	(1994b) Tensile Properties of Plastics
ASTM D 1004	(1994a) Initial Tear Resistance of Plastic Film and Sheeting
ASTM D 1248	(1984; R 1989) Polyethylene Plastics Molding and Extrusion Materials
ASTM D 1785	(1993) Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
ASTM D 2000	(1990; R 1994) Rubber Products in Automotive Applications
ASTM D 2235	(1993a) Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings
ASTM D 2239	(1993) Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter
ASTM D 2241	(1993) Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
ASTM D 2447	(1993) Polyethylene (PE) Plastic Pipe, Schedules 40 and 80, Based on Outside Diameter
ASTM D 2464	(1993) Threaded Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
ASTM D 2466	(1993) Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40
ASTM D 2467	(1993) Socket-Type Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
ASTM D 2485	(1991) Evaluating Coatings for High Temperature Service
ASTM D 2564	(1993) Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems

ASTM D 2657	(1990) Heat-Joining Polyolefin Pipe and Fittings
ASTM D 2661	(1994a) Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe and Fittings
ASTM D 2665	(1994) Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings
ASTM D 2672	(1994) Joints for IPS PVC Pipe Using Solvent Cement
ASTM D 2683	(1993) Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing
ASTM D 2737	(1993) Polyethylene (PE) Plastic Tubing
ASTM D 2822	(1991) Asphalt Roof Cement
ASTM D 2846	(1993) Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Hot- and Cold-Water Distribution Systems
ASTM D 2855	(1993) Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings
ASTM D 2996	(1995) Filament-Wound "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe
ASTM D 3035	(1993) Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter
ASTM D 3122	(1993) Solvent Cements for Styrene-Rubber (SR) Plastic Pipe and Fittings
ASTM D 3138	(1993) Solvent Cements for Transition Joints Between Acrylonitrile-Butadiene-Styrene (ABS) and Poly(Vinyl Chloride) (PVC) Non-pressure Piping Components
ASTM D 3139	(1989; R 1995) Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
ASTM D 3212	(1992) Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
ASTM D 3261	(1993) Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing
ASTM D 3308	(1991a) PTFE Resin Skived Tape

ASTM D 3311	(1992) Drain, Waste, and Vent (DWV) Plastic Fittings Patterns
ASTM D 4060	(1995) Abrasion Resistance of Organic Coatings by the Taber Abraser
ASTM D 4101	(1994) Propylene Plastic Injection and Extrusion Materials
ASTM D 4551	(1991) Poly(Vinyl Chloride) (PVC) Plastic Flexible Concealed Water-Containment Membrane
ASTM E 1	(1995) ASTM Thermometers
ASTM E 96	(1996) Water Vapor Transmission of Materials
ASTM F 409	(1993) Thermoplastic Accessible and Replaceable Plastic Tube and Tubular Fittings
ASTM F 437	(1993) Threaded Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80
ASTM F 438	(1993) Socket-Type Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40
ASTM F 439	(1993a) Socket-Type Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80
ASTM F 441	(1994) Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80
ASTM F 442	(1994) Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe (SDR-PR)
ASTM F 477	(1993) Elastomeric Seals (Gaskets) for Joining Plastic Pipe
ASTM F 493	(1993a) Solvent Cements for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe and Fittings
ASTM F 628	(1993) Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe with a Cellular Core
ASTM F 891	(1993a) Coextruded Poly(Vinyl Chloride) (PVC) Plastic Pipe with a Cellular Core
ASTM F 1290	(1993) Electrofusion Joining Polyolefin Pipe and Fittings

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING
ENGINEERS (ASHRAE)

ASHRAE 34	(1994) Designation and Safety Classification of Refrigerants
ASHRAE 90.1	(1989; 90.1b; 90.1c; 90.1d; 90.1e; 90.1g; 90.1i) Energy Efficient Design of New Buildings Except Low-Rise Residential Buildings

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME A112.1.2	(1991) Air Gaps in Plumbing Systems
ASME A112.6.1M	(1988) Supports for Off-the-Floor Plumbing Fixtures for Public Use
ASME A112.14.1	(1975; R 1990) Backwater Valves
ASME A112.18.1M	(1994; Errata Feb 1995) Plumbing Fixture Fittings
ASME A112.19.1M	(1994) Enameled Cast Iron Plumbing Fixtures
ASME A112.19.2M	(1990) Vitreous China Plumbing Fixtures
ASME A112.19.3M	(1987) Stainless Steel Plumbing fixtures (Designed for Residential Use)
ASME A112.19.4M	(1994) Porcelain Enameled Formed Steel Plumbing Fixtures
ASME A112.21.1M	(1991) Floor Drains
ASME A112.21.2M	(1983) Roof Drains
ASME A112.36.2M	(1991) Cleanouts
ASME B1.20.1	(1983; R 1992) Pipe Threads, General Purpose (Inch)
ASME B16.3	(1992) Malleable Iron Threaded Fittings
ASME B16.4	(1992) Cast Iron Threaded Fittings
ASME B16.5	(1988; Errata Oct 88; B16.5a) Pipe Flanges and Flanged Fittings
ASME B16.12	(1991) Cast Iron Threaded Drainage Fittings
ASME B16.15	(1985; R 1994) Cast Bronze Threaded Fittings Classes 125 and 250
ASME B16.18	(1984; R 1994) Cast Copper Alloy Solder Joint Pressure Fittings
ASME B16.21	(1992) Nonmetallic Flat Gaskets for Pipe Flanges

ASME B16.22	(1989) Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
ASME B16.23	(1992; Errata Jan 1994) Cast Copper Alloy Solder Joint Drainage Fittings - DWV
ASME B16.24	(1991; Errata Jun 91) Cast Copper Alloy Pipe Flanges, Class 150, 300, 400, 600, 900, 1500 and 2500, and Flanged Fittings, Class 150 and 300
ASME B16.29	(1994) Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV
ASME B16.39	(1986; R 1994) Malleable Iron Threaded Pipe Unions Classes 150, 250, and 300
ASME B31.1	(1995) Power Piping
ASME B31.5	(1992; B31.5a) Refrigeration Piping
ASME B40.1	(1991) Gauges - Pressure Indicating Dial Type - Elastic Element
ASME BPV VIII Div 1	(1995; Addenda Dec 1995) Boiler and Pressure Vessel Code; Section VIII, Pressure Vessels Division 1 - Basic Coverage
ASME BPV IX	(1995; Addenda Dec 1995) Boiler and Pressure Vessel Code; Section IX, Welding and Brazing Qualifications
ASME CSD-1	(1992; CSD-1a; CSD-1b) Controls and Safety Devices for Automatically Fired Boilers

AMERICAN SOCIETY OF SANITARY ENGINEERING (ASSE)

ASSE 1001	(1990) Pipe Applied Atmospheric Type Vacuum Breakers
ASSE 1002	(1992) Water Closet Flush Tank Ball Locks
ASSE 1003	(1981) Water Pressure Reducing Valves for Domestic Water Supply Systems
ASSE 1005	(1993) Water Heater Drain Valves - 3/4-Inch Iron Pipe Size
ASSE 1006	(1986) Residential Use (Household) Dishwashers
ASSE 1011	(1993) Hose Connection Vacuum Breakers
ASSE 1012	(1993) Backflow Preventers with Intermediate Atmospheric Vent
ASSE 1013	(1993) Reduced Pressure Principle Backflow

Preventers

- ASSE 1018 (1986) Trap Seal Primer Valves Water Supply Fed
- ASSE 1037 (1990) Pressurized Flushing Devices (Flushometers) for Plumbing Fixtures/F

AMERICAN WATER WORKS ASSOCIATION (AWWA)

- AWWA-10062J4 (1992) Standard Methods for the Examination of Water and Wastewater
- AWWA B300 (1992) Hypochlorites
- AWWA B301 (1992) Liquid Chlorine
- AWWA C105 (1988) Polyethylene Encasement for Ductile-Iron Piping for Water and Other Liquids
- AWWA C203 (1991) Coal-Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape - Hot-Applied
- AWWA C606 (1987) Grooved and Shouldered Joints
- AWWA C700 (1990; C700a) Cold-Water Meters - Displacement Type, Bronze Main Case
- AWWA M20 (1973) Manual: Water Chlorination Principles and Practices

AMERICAN WELDING SOCIETY (AWS)

- AWS A5.8 (1992) Filler Metals for Brazing and Braze Welding
- AWS B2.2 (1991) Brazing Procedure and Performance Qualification

CAST IRON SOIL PIPE INSTITUTE (CISPI)

- CISPI 301 (1990) Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications
- CISPI HSN (1985) Neoprene Rubber Gaskets for Hub and Spigot Cast Iron Soil Pipe and Fittings

CODE OF FEDERAL REGULATIONS (CFR)

- 10 CFR 430 Energy Conservation Program for Consumer Products
- 21 CFR 175 Indirect Food Additives: Adhesives and Components of Coatings

COMMERCIAL ITEM DESCRIPTIONS (CID)

CID A-A-238	(Rev B) Seat, Water Closet
CID A-A-240	(Basic) Shower Head, Ball Joint
CID A-A-50012	(Basic) Garbage Disposal Machine, Commercial

COPPER DEVELOPMENT ASSOCIATION (CDA)

CDA 404/O-RR	(1993) Copper Tube for Plumbing, Heating, Air Conditioning and Refrigeration
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COUNCIL OF AMERICAN BUILDING OFFICIALS (CABO)

CABO A117.1	(1992; Errata Jun 1993) American National Standard for Accessible and Usable buildings and Facilities
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FOUNDATION FOR CROSS-CONNECTION CONTROL AND HYDRAULIC RESEARCH
(FCCHR)

FCCHR-01	(1993) Manual of Cross-Connection Control
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HYDRAULIC INSTITUTE (HI)

HI-01	(1983) Standards for Centrifugal, Rotary & Reciprocating Pumps
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MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS
INDUSTRY (MSS)

MSS SP-25	(1993) Standard Marking System for Valves, Fittings, Flanges and Unions
MSS SP-44	(1991) Steel Pipe Line Flanges
MSS SP-58	(1993) Pipe Hangers and Supports - Materials, Design and Manufacture
MSS SP-67	(1995) Butterfly Valves
MSS SP-69	(1991) Pipe Hangers and Supports - Selection and Application
MSS SP-70	(1990) Cast Iron Gate Valves, Flanged and Threaded Ends
MSS SP-71	(1990) Cast Iron Swing Check Valves, Flanges and Threaded Ends
MSS SP-72	(1992) Ball Valves with Flanged or Butt-welding Ends for General Service
MSS SP-73	(1991) Brazing Joints for Copper and Copper Alloy Pressure Fittings

MSS SP-78	(1987; R 1992) Cast Iron Plug Valves, Flanged and Threaded Ends
MSS SP-80	(1987) Bronze Gate, Globe, Angle and Check Valves
MSS SP-83	(1995) Class 3000 Steel Pipe Unions Socket-Welding and Threaded
MSS SP-84	(1990) Valves - Socket Welding and Threaded Ends
MSS SP-85	(1994) Cast Iron Globe & Angle Valves, Flanged and Threaded Ends
MSS SP-110	(1992) Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends

NATIONAL ASSOCIATION OF PLUMBING-HEATING-COOLING CONTRACTORS
(NAPHCC)

NAPHCC-01	(1993; Supple 1994) National Standard Plumbing Code (Non-Illustrated Edition)
NAPHCC-02	(1993) National Standard Plumbing Code (Illustrated Edition)

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250	(1991) Enclosures for Electrical Equipment (1000 Volts Maximum)
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NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 31	(1992) Installation of Oil Burning Equipment
NFPA 54	(1992) National Fuel Gas Code
NFPA 90A	(1993) Installation of Air Conditioning and Ventilating Systems

NSF INTERNATIONAL (NSF)

NSF Std 3	(1982) Dishwashing Machines/Commercial Spray Type
NSF Std 5	(1992) Hot Water Generating Equipment
NSF Std 14	(1965; Rev Nov 1990) Plastics Piping Components and Related Materials

PLASTIC PIPE AND FITTINGS ASSOCIATION (PPFA)

PPFA-01	(1991) Plastic Pipe in Fire Resistive Construction
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PLUMBING AND DRAINAGE INSTITUTE (PDI)

PDI G-101 (1985) Testing and Rating Procedures for Grease Interceptors

PDI WH 201 (1992) Water Hammer Arresters

SOCIETY OF AUTOMOTIVE ENGINEERS (SAE)

SAE J1508 (1993) Hose Clamps

STEEL STRUCTURES PAINTING COUNCIL (SSPC)

SSPC SP 5 (1991) White Metal Blast Cleaning

UNDERWRITERS LABORATORIES (UL)

UL 174 (1989; Rev thru Jan 1991) Household Electric Storage-Tank Water Heaters

UL 430 (1994; Rev Nov 95) Waste Disposers

UL 732 (1988) Oil-Fired Storage Tank Water Heaters

UL 749 (1995) Household Dishwashers

UL 921 (1992) Commercial Electric Dishwashers

1.2 STANDARD PRODUCTS

Specified materials and equipment shall be standard products of a manufacturer regularly engaged in the manufacture of such products. Specified equipment shall essentially duplicate equipment that has performed satisfactorily at least two years prior to bid opening.

1.3 PERFORMANCE REQUIREMENTS

1.4 ELECTRICAL WORK

Motors, motor controllers and motor efficiencies shall conform to the requirements of Section 16415 ELECTRICAL WORK, INTERIOR. Electrical motor-driven equipment specified herein shall be provided complete with motors. Equipment shall be rated at 60 Hz, single phase, ac unless otherwise indicated. Where a motor controller is not provided in a motor-control center on the electrical drawings, a motor controller shall be as indicated. Motor controllers shall be provided complete with properly sized thermal-overload protection in each ungrounded conductor, auxiliary contact, and other equipment, at the specified capacity, and including an allowable service factor.

1.5 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL PROCEDURES:

SD-04 Drawings

Plumbing System; FIO.

Detail drawings consisting of illustrations, schedules, performance charts, instructions, brochures, diagrams, and other information to illustrate the requirements and operations of each system. Detail drawings for the complete plumbing system including piping layouts and locations of connections; dimensions for roughing-in, foundation, and support points; schematic diagrams and wiring diagrams or connection and interconnection diagrams. Detail drawings shall indicate clearances required for maintenance and operation. Where piping and equipment are to be supported other than as indicated, details shall include loadings and proposed support methods. Mechanical drawing plans, elevations, views, and details, shall be drawn to scale.

Electrical Schematics; FIO.

Complete electrical schematic lineless or full line interconnection and connection diagram for each piece of mechanical equipment having more than one automatic or manual electrical control device.

SD-06 Instructions

Plumbing System; FIO.

Diagrams, instructions, and other sheets proposed for posting. Manufacturer's recommendations for the installation of bell and spigot and hubless joints for cast iron soil pipe.

SD-13 Certificates

Materials and Equipment; FIO.

Where materials or equipment are specified to comply with requirements of AGA, or ASME, proof of such compliance. The label or listing of the specified agency will be acceptable evidence. In lieu of the label or listing, a written certificate may be submitted from an approved, nationally recognized testing organization equipped to perform such services, stating that the items have been tested and conform to the requirements and testing methods of the specified agency. Where equipment is specified to conform to requirements of the ASME Boiler and Pressure Vessel Code, the design, fabrication, and installation shall conform to the code.

SD-19 Operation and Maintenance Manuals

Plumbing System; FIO.

Six copies of the operation manual outlining the step-by-step procedures required for system startup, operation and shutdown. The manual shall include the manufacturer's name, model number, service manual, parts list, and brief description of all equipment and their basic operating features. Six copies of the maintenance manual listing routine maintenance procedures, possible breakdowns and repairs. The manual shall include

pipng and equipment layout and simplified wiring and control diagrams of the system as installed.

1.6 REGULATORY REQUIREMENTS

1.6.1 Plumbing

Plumbing work shall be in accordance with NAPHCC-01, unless otherwise stated and installed in accordance with NAPHCC-02.

1.7 PROJECT/SITE CONDITIONS

The Contractor shall become familiar with details of the work, verify dimensions in the field, and advise the Contracting Officer of any discrepancy before performing any work.

PART 2 PRODUCTS

2.1 MATERIALS

Materials for various services shall be in accordance with TABLES I. Pipe schedules shall be selected based on service requirements. Pipe fittings shall be compatible with the applicable pipe materials. Plastic pipe, fittings, and solvent cement shall meet NSF Std 14 and shall be NSF listed for the service intended. Plastic pipe, fittings, and solvent cement used for potable hot and cold water service shall bear the NSF seal "NSF-PW." Polypropylene pipe and fittings shall conform to dimensional requirements of Schedule 40, Iron Pipe size. Pipe threads (except dry seal) shall conform to ASME B1.20.1. Grooved pipe couplings and fittings shall be from the same manufacturer. Material or equipment containing lead shall not be used in any potable water system. Hubless cast-iron soil pipe shall not be installed under concrete floor slabs or in crawl spaces below kitchen floors. Plastic pipe shall not be installed in air plenums. Plastic pipe shall not be installed in a pressure piping system in buildings greater than three stories including any basement levels.

2.1.1 Pipe Joint Materials

Grooved pipe shall not be used under ground. Joints and gasket materials shall conform to the following:

- a. Coupling for Cast-Iron Pipe: ASTM A 74, AWWA C606.
- b. Coupling for Steel Pipe: AWWA C606.
- d. Flange Gaskets: Gaskets shall be made of non-asbestos material in accordance with ASME B16.21. Gaskets shall be flat, 1.6 mm (1/16 inch) thick, and contain Aramid fibers bonded with Styrene Butadiene Rubber (SBR) or Nitro Butadiene Rubber (NBR). Gaskets shall be the full face or self centering flat ring type. Gaskets used for hydrocarbon service shall be bonded with NBR.
- e. Neoprene Gaskets for Hub and Cast-Iron Pipe and Fittings: CISPI HSN.
- f. Brazing Material: Brazing material shall conform to AWS A5.8, BCuP-5.
- g. Brazing Flux: Flux shall be in paste or liquid form appropriate for use with brazing material. Flux shall be as follows:

lead-free; have a 100 percent flushable residue; contain slightly acidic reagents; contain potassium borides; and contain fluorides. Silver brazing materials shall be in accordance with AWS A5.8.

- h. Solder Material: Solder metal shall conform to ASTM B 32 95-5 tin-antimony.
- i. Solder Flux: Flux shall be liquid form, non-corrosive, and conform to ASTM B 813, Standard Test 1.
- j. PTFE Tape: PTFE Tape, for use with Threaded Metal or Plastic Pipe, ASTM D 3308.
- k. Rubber Gaskets for Cast-Iron Soil-Pipe and Fittings: ASTM C 564.
- l. Rubber Gaskets for Grooved Pipe: ASTM D 2000, maximum temperature 110 degrees C (230 degrees F).
- m. Flexible Elastomeric Seals: ASTM D 3139, ASTM D 3212 or ASTM F 47.
- o. Solvent Cement for Transition Joints between ABS and PVC Nonpressure Piping Components: ASTM D 3138.
- p. Plastic Solvent Cement for ABS Plastic Pipe: ASTM D 2235.
- q. Plastic Solvent Cement for PVC Plastic Pipe: ASTM D 2564 and ASTM D 2855.
- r. Plastic Solvent Cement for CPVC Plastic Pipe: ASTM F 493.
- s. Flanged fittings including flanges, bolts, nuts, bolt patterns, etc. shall be in accordance with ASME B16.5 class 150 and shall have the manufacturer's trademark affixed in accordance with MSS SP-25. Flange material shall conform to ASTM A 105. Blind flange material shall conform to ASTM A 516 cold service and ASTM A 515 for hot service. Bolts shall be high strength or intermediate strength with material conforming to ASTM A 193.
- t. Plastic Solvent Cement for Styrene Rubber Plastic Pipe: ASTM D 3122.

2.1.1.2 Miscellaneous Materials

Miscellaneous materials shall conform to the following:

- b. Copper, Sheet and Strip for Building Construction: ASTM B 370.
- c. Asphalt Roof Cement: ASTM D 2822.
- d. Hose Clamps: SAE J1508.
- f. Metallic Cleanouts: ASME A112.36.2M.
- i. Hypochlorites: AWWA B300.
- j. Liquid Chlorine: AWWA B301.
- k. Polyethylene Encasement for Ductile-Iron Piping: AWWA C105.
- l. Gauges - Pressure and Vacuum Indicating Dial Type - Elastic

Element: ASME B40.1.

m. Thermometers: ASTM E 1.

2.1.3 Pipe Insulation Material

2.2 DRAINS

2.2.1 FloorDrains

Floor drains shall consist of a galvanized body, integral seepage pan, and adjustable perforated or slotted chromium-plated bronze, nickel-bronze, or nickel-brass strainer, consisting of grate and threaded collar. Floor drains shall be cast iron except where metallic waterproofing membrane is installed. Drains shall be of double drainage pattern for embedding in the floor construction. The seepage pan shall have weep holes or channels for drainage to the drainpipe. The strainer shall be adjustable to floor thickness. A clamping device for attaching flashing or waterproofing membrane to the seepage pan without damaging the flashing or waterproofing membrane shall be provided when required. Drains shall be provided with threaded or caulked connection. In lieu of a caulked joint between the drain outlet and waste pipe, a neoprene rubber gasket conforming to ASTM C 564 may be installed, provided that the drain is specifically designed for the rubber gasket compression type joint. Floor drains shall conform to ASME A112.21.1M.

2.2.2 Floor Sinks

Floor sinks shall be square, with 300 mm (12 inch) nominal overall width or diameter and 250 mm (10 inch) nominal overall depth. Floor sink shall have an acid-resistant enamel interior finish with cast-iron body, aluminum sediment bucket, and perforated grate of cast iron in industrial areas and stainless steel in finished areas. The outlet pipe size shall be as indicated or of the same size as the connecting pipe.

2.2.3 Pit Drains

Pit drains shall consist of a body, integral seepage pan, and nontilting perforated or slotted grate. Drains shall be of double drainage pattern suitable for embedding in the floor construction. The seepage pan shall have weep holes or channels for drainage to the drain pipe. Membrane or flashing clamping device shall be provided when required. Drains shall be cast iron with manufacturer's standard coating. Drains shall be circular and provided with bottom outlet suitable for inside caulked connection, unless otherwise indicated. Drains shall be provided with separate cast-iron "P" traps, unless otherwise indicated.

2.3 PUMPS

2.3.1 Sump Pumps

Sump pumps shall be of capacities indicated. The pumps shall be of the automatic, electric motor-driven, submerged type, complete with necessary control equipment. The pumps shall be direct-connected to a vertical electric motor having a continuous oiling device or packed bearings sealed against dirt and moisture. Motors shall be totally enclosed, fan-cooled of sizes as indicated and shall be equipped with an across-the-line magnetic controller in a NEMA 250, Type 1 enclosed, across-the-line, magnetic controller. The suction side of each pump shall have a strainer of ample

capacity. A float switch assembly, with the switch completely enclosed in a NEMA 250, Type 1 enclosure, shall start and stop each motor at predetermined water levels. The discharge line from each pump shall be provided with a union or flange, a nonclog swing check valve, and a stop valve in an accessible location near the pump.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

Hubless cast-iron pipe shall not be installed under concrete floor slabs. Piping located in air plenums shall conform to NFPA 90A requirements. Unprotected plastic pipe shall not be installed in air plenum. Installation of plastic pipe where in compliance with NFPA may be installed in accordance with PPFA-01. The plumbing system shall be installed complete with necessary fittings, traps, valves, and accessories. Water and drainage piping shall be extended 1.5 m outside the building, unless otherwise indicated. A gate valve and drain shall be installed on the water service line inside the building approximately 150 mm above the floor from point of entry. Piping shall be connected to the exterior service lines or capped or plugged if the exterior service is not in place. Sewer and water pipes shall be laid in separate trenches, except when otherwise shown. Exterior underground utilities shall be at least 300 mm below the average local frost depth. If trenches are closed or the pipes are otherwise covered before being connected to the service lines, the location of the end of each plumbing utility shall be marked with a stake or other acceptable means. Valves shall be installed with control no lower than the valve body.

3.1.1 Joints

Installation of pipe and fittings shall be made in accordance with the manufacturer's recommendations. Mitering of joints for elbows and notching of straight runs of pipe for tees will not be permitted. Joints shall be made up with fittings of compatible material and made for the specific purpose intended.

3.1.1.1 Threaded

Threaded joints shall have American Standard taper pipe threads conforming to ASME B1.20.1. Only male pipe threads shall be coated with graphite or with an approved graphite compound, or with an inert filler and oil, or shall have a polytetrafluoroethylene tape applied.

3.1.1.2 Mechanical Couplings

Grooved mechanical joints shall be prepared according to the coupling manufacturer's instructions. Pipe and groove dimensions shall comply with the tolerances specified by the coupling manufacturer. The diameter of grooves made in the field shall be measured using a "go/no-go" gauge, vernier or dial caliper, or narrow-land micrometer. Groove width and dimension of groove from end of the pipe shall be measured and recorded for each change in grooving tool setup to verify compliance with coupling manufacturer's tolerances. Grooved joints shall not be used in concealed locations.

3.1.1.3 Union and Flanged

Unions, flanges and mechanical couplings shall not be concealed in walls,

ceilings, or partitions. Unions shall be used on pipe sizes 65 mm (2-1/2 inches) and smaller; flanges shall be used on pipe sizes 80 mm (3 inches) and larger.

3.1.1.4 Cast Iron Soil, Waste and Vent Pipe

Bell and spigot compression and hubless gasketed clamp joints for soil, waste and vent piping shall be installed per the manufacturer's recommendations.

3.1.1.5 Copper Tube and Pipe

The tube or fittings shall not be annealed when making connections. Connections shall be made with a multiflame torch.

- a. Brazed. Brazed joints shall be made in conformance with AWS B2.2, MSS SP-73, and CDA 404/O-RR with flux and are acceptable for line sizes. Copper to copper joints shall include the use of copper-phosphorus or copper-phosphorus-silver brazing metal without flux. Brazing of dissimilar metals (copper to bronze or brass) shall include the use of flux with either a copper-phosphorus, copper-phosphorus-silver or a silver brazing filler metal.
- b. Soldered. Soldered joints shall be made with flux and are only acceptable for lines 50 mm (2 inches) and smaller. Soldered joints shall conform to ASME B31.5 and CDA 404/O-RR.
- c. Copper Tube Extracted Joint. An extracted mechanical joint may be made in copper tube. Joint shall be produced with an appropriate tool by drilling a pilot hole and drawing out the tube surface to form a collar having a minimum height of three times the thickness of the tube wall. To prevent the branch tube from being inserted beyond the depth of the extracted joint, dimpled depth stops shall be provided. Branch tube shall be notched for proper penetration into fitting to ensure a free flow joint. Extracted joints shall be brazed in accordance with NAPHCC-01 using B-Cup series filler metal in accordance with MSS SP-73. Soldered extracted joints will not be permitted.

3.1.1.6 Plastic Pipe

Acrylonitrile-Butadiene-Styrene (ABS) pipe shall have joints made with solvent cement. PVC and CPVC pipe shall have joints made with solvent cement elastomeric, threading, (threading of Schedule 80 Pipe is allowed only where required for disconnection and inspection; threading of Schedule 40 Pipe is not allowed), or mated flanged.

3.1.1.7 Other Joint Methods

3.1.2 Dissimilar Pipe Materials

Connections between ferrous and non-ferrous copper pipe shall be made with dielectric unions or flange waterways. Connecting joints between plastic and metallic pipe shall be made with transition fitting for the specific purpose.

3.1.3 Pipe Sleeves and Flashing

Pipe sleeves shall be furnished and set in their proper and permanent location.

3.1.3.1 Sleeve Requirements

Pipes passing through concrete or masonry walls or concrete floors or roofs shall be provided with pipe sleeves fitted into place at the time of construction. Sleeves are not required for cast-iron soil pipe passing through concrete slab on grade, except where penetrating a membrane waterproof floor. A modular mechanical type sealing assembly may be installed in lieu of a waterproofing clamping flange and caulking and sealing of annular space between pipe and sleeve. The seals shall consist of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and sleeve with corrosion-protected carbon steel bolts, nuts, and pressure plates. The links shall be loosely assembled with bolts to form a continuous rubber belt around the pipe with a pressure plate under each bolt head and each nut. After the seal assembly is properly positioned in the sleeve, tightening of the bolt shall cause the rubber sealing elements to expand and provide a watertight seal between the pipe and the sleeve. Each seal assembly shall be sized as recommended by the manufacturer to fit the pipe and sleeve involved. Sleeves shall not be installed in structural members, except where indicated or approved. Rectangular and square openings shall be as detailed. Each sleeve shall extend through its respective floor, or roof, and shall be cut flush with each surface, except for special circumstances. Pipe sleeves passing through floors in wet areas such as mechanical equipment rooms shall extend a minimum of 100 mm above the finished floor.

Unless otherwise indicated, sleeves shall be of a size to provide a minimum of 6 mm (1/4 inch) clearance between bare pipe and inside of sleeve or between jacket over insulation and sleeves. Sleeves in bearing walls shall be steel pipe or cast-iron pipe. Sleeves for membrane waterproof floors shall be steel pipe, cast-iron pipe, or plastic pipe. Membrane clamping devices shall be provided on pipe sleeves for waterproof floors. Sleeves in nonbearing walls or ceilings may be steel pipe, cast-iron pipe, galvanized sheet metal with lock-type longitudinal seam, or moisture-resistant fiber or plastic. Plastic sleeves shall not be used in nonbearing fire walls, roofs, or floor/ceilings. Except as otherwise specified, the annular space between pipe and sleeve, or between jacket over insulation and sleeve, shall be sealed as indicated with sealants conforming to ASTM C 920 and with a primer, backstop material and surface preparation as specified in Section 07920 JOINT SEALING. Pipes passing through sleeves in concrete floors over crawl spaces shall be sealed as specified above. The annular space between pipe and sleeve or between jacket over insulation and sleeve shall not be sealed for interior walls which are not designated as fire rated. Sleeves through below-grade walls in contact with earth shall be recessed 15 mm from wall surfaces on both sides. Annular space between pipe and sleeve shall be filled with backing material and sealants in the joint between the pipe and concretewall as specified above. Sealant selected for the earth side of the wall shall be compatible with dampproofing/waterproofing materials that are to be applied over the joint sealant.

3.1.3.2 Pipe Penetrations of Slab on Grade Floors

Where pipes, floor drains, cleanouts or similar items penetrate slab on grade floors, except at penetrations of floors with waterproofing membrane as specified in paragraphs Flashing Requirements and Waterproofing, a groove 6 to 13 mm wide by 6 to 10 mm deep shall be formed around the pipe, fitting or drain. The groove shall be filled with a sealant as

specified in Section 07920 JOINT SEALING.

3.1.4 Pipe Cleanouts

Pipe cleanouts shall be the same size as the pipe except that cleanout plugs larger than 100 mm (4 inches) will not be required. A cleanout installed in connection with cast-iron soil pipe shall consist of a long-sweep 1/4 bend or one or two 1/8 bends extended to the place shown. An extra-heavy cast-brass or cast-iron ferrule with countersunk cast-brass head screw plug shall be caulked into the hub of the fitting and shall be flush with the floor. Cleanouts in connection with other pipe, where indicated, shall be T-pattern, 90-degree branch drainage fittings with cast-brass screw plugs, except plastic plugs shall be installed in plastic pipe. Plugs shall be the same size as the pipe up to and including 100 mm (4 inches). Cleanouts installed in finished floors subject to foot traffic shall be provided with a chrome-plated cast brass, nickel brass, or nickel bronze cover secured to the plug or cover frame and set flush with the finished floor. Heads of fastening screws shall not project above the cover surface. Where cleanouts are provided with adjustable heads, the heads shall be cast iron.

3.2 IDENTIFICATION SYSTEMS

3.2.1 Identification Tags

Identification tags made of brass, engraved laminated plastic, or engraved anodized aluminum, indicating service and valve number shall be installed on valves, except those valves installed on supplies at plumbing fixtures. Tags shall be 35 mm (1-3/8 inch) minimum diameter, and marking shall be stamped or engraved. Indentations shall be black, for reading clarity. Tags shall be attached to valves with No. 12 AWG, copper wire, chrome-plated beaded chain, or plastic straps designed for that purpose.

3.2.2 Color Coding

Color coding for piping identification shall be as specified in Section 09900 PAINTING, GENERAL.

3.3 TESTS, FLUSHING, AND STERILIZATION

3.3.1 Plumbing System

The plumbing system shall be tested in accordance with NAPHCC-01.

3.3.2 Defective Work

If inspection or test shows defects, such defective work or material shall be replaced or repaired as necessary and inspection and tests shall be repeated. Repairs to piping shall be made with new materials. Caulking of screwed joints or holes will not be permitted.

3.3.3 System Flushing

After tests are completed, potable water piping shall be flushed. In general, sufficient water shall be used to produce a minimum water velocity of 0.762 meters per second (2.5 feet per second) through piping being flushed. Flushing shall be continued until discharge water shows no discoloration. System shall be drained at low points. Strainer screens shall be removed, cleaned, and replaced in line. Any stoppage,

discoloration, or other damage to the finish, furnishings, or parts of the building due to the Contractor's failure to properly clean the piping system shall be repaired by the Contractor.

3.3.4 Operational Test

Upon completion of and prior to acceptance of the installation, the Contractor shall subject the plumbing system to operating tests to demonstrate satisfactory functional and operational efficiency. Such operating tests shall cover a period of not less than 8 hours for each system and shall include the following information in a report with conclusion as to the adequacy of the system:

- a. Time, date, and duration of test.
- b. Pump suction and discharge pressures.
- c. Operation of each floor drain by flooding with water.

TABLE I
PIPE AND FITTING MATERIALS FOR
DRAINAGE, WASTE, AND VENT PIPING SYSTEMS

Item No.	Pipe and Fitting Materials	SERVICE		
		A	B	C
1	Cast iron soil pipe and fittings, hub and spigot, ASTM A 74 with compression gaskets	X	X	X
2	Cast iron pipe and fittings hubless, CISPI 301 and ASTM A 888	X	X	X
3	Cast iron drainage fittings, threaded, ASME B16.12 for use with Item 10	X		X
4	Cast iron screwed fittings (threaded) ASME B16.4 for use with Item 10			X
5	Grooved pipe couplings, ferrous and non-ferrous pipe ASTM A 536 and ASTM A 47	X		X
6	Ductile iron grooved joint fittings for ferrous pipe ASTM A 536 and ASTM A 47 for use with Item 5	X		X
7	Bronze sand casting grooved joint pressure fittings for non-ferrous pipe ASTM B 584, for use with Item 5	X		X
8	Wrought copper grooved joint pressure fittings for non-ferrous pipe ASTM B 75 C12200, ASTM B 152 C11000, ASME B16.22 ASME B16.22 for use with Item 5	X		
9	Malleable-iron threaded fittings, galvanized ASME B16.3 for use with Item 10			X
10	Steel pipe, seamless galvanized, ASTM A 53, Type S, Grade B	X		X
11	Seamless red brass pipe, ASTM B 43		X	
12	Bronzed flanged fittings, ASME B16.24 for use with Items 11 and 14			X
13	Cast copper alloy solder joint pressure fittings, ASME B16.18			X

TABLE I
PIPE AND FITTING MATERIALS FOR
DRAINAGE, WASTE, AND VENT PIPING SYSTEMS

Item No.	Pipe and Fitting Materials	SERVICE		
		A	B	C
	for use with Item 14			
14	Seamless copper pipe, ASTM B 42			X
15	Cast bronze threaded fittings, ASME B16.15		X	X
16	Copper drainage tube, (DWV), ASTM B 306	X*	X*	
17	Wrought copper and wrought alloy solder-joint drainage fittings. ASME B16.29	X	X	
18	Cast copper alloy solder joint drainage fittings, DWV, ASME B16.23	X	X	
19	Acrylonitrile-Butadiene-Styrene (ABS) plastic drain, waste, and vent pipe and fittings ASTM D 2661, ASTM F 628	X	X	
20	Polyvinyl Chloride plastic drain, waste and vent pipe and fittings, ASTM D 2665, ASTM F 891, (Sch 40)	X	X	
21	Polypropylene (PP) waste pipe and fittings, ASTM D 4101		X	

SERVICE:

-
- A - Underground Building Soil, Waste and Storm Drain
 B - Underground Vent
 C - Aboveground Vent
 * - Hard Temper
 -- End of Section --

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SECTION 15562

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SECTION 15562

HEATING AND UTILITIES SYSTEMS, CENTRAL STEAM

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AIR CONDITIONING AND REFRIGERATION INSTITUTE (ARI)

ARI 850	(1984) Commercial and Industrial Air Filter Equipment
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AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 53	(1993) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
ASTM A 106	(1993) Seamless Carbon Steel Pipe for High-Temperature Service
ASTM A 181	(1993a) Forgings, Carbon Steel, for General-Purpose Piping
ASTM A 366	(1991) Steel, Sheet, Carbon, Cold-Rolled, Commercial Quality
ASTM A 525	(1993) General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process
ASTM A 527	(1990) Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Lock-Forming Quality
ASTM A 528	(1990) Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Drawing Quality
ASTM A 569	(1991a) Steel, Carbon (0.15 Maximum, Percent), Hot-Rolled Sheet and Strip Commercial Quality
ASTM A 642	(1990) Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Drawing Quality, Special Killed
ASTM A 733	(1989) Welded and Seamless Carbon Steel and Austenitic Stainless Steel Pipe Nipples
ASTM B 88	(1993a) Seamless Copper Water Tube

ASTM B 251	(1993) Wrought Seamless Copper and Copper-Alloy Tube
ASTM C 700	(1991) Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated
ASTM D 635	(1991) Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position
ASTM D 1248	(1984; R 1989) Polyethylene Plastics Molding and Extrusion Materials
ASTM D 1693	(1970; R 1988) Environmental Stress-Cracking of Ethylene Plastics
ASTM D 3308	(1991a) PTFE Resin Skived Tape

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B1.20.1	(1983; R 1992) Pipe Threads, General Purpose (Inch)
ASME B16.1	(1989) Cast Iron Pipe Flanges and Flanged Fittings
ASME B16.3	(1992) Malleable Iron Threaded Fittings
ASME B16.4	(1992) Cast Iron Threaded Fittings
ASME B16.5	(1988; Errata; B16.5a) Pipe Flanges and Flanged Fittings
ASME B16.9	(1993) Factory-Made Wrought Steel Buttwelding fittings
ASME B16.15	(1985) Cast Bronze Threaded Fittings Classes 125 and 250
ASME B16.18	(1984) Cast Copper Alloy Solder Joint Pressure Fittings
ASME B16.21	(1992) Nonmetallic Flat Gaskets for Pipe Flanges
ASME B16.39	(1986) Malleable Iron Threaded Pipe Unions Classes 150, 250, and 300
ASME B19.3	(1991) Safety Standard for Compressors for Process Industries
ASME B31.1	(1992; B31.1a; B31.1b) Power Piping
ASME B40.1	(1991) Gauges - Pressure Indicating Dial Type - Elastic Element
ASME BPV VIII Div 1	(1992; Addenda Dec 1992, Dec 1993) Boiler and Pressure Vessel Code; Section VIII, Pressure Vessels Division 1 - Basic

Coverage

ASME BPV IX (1992; Addenda Dec 1992, Dec 1993) Boiler and Pressure Vessel Code; Section IX, Welding and Brazing Qualifications

ASME PTC 19.3 (1974; R 1986) Instruments and Apparatus: Part 3 Temperature Measurement

AMERICAN WELDING SOCIETY (AWS)

AWS A5.8 (1992) Filler Metals For Brazing and Braze Welding

AWS D1.1 (1994) Structural Welding Code - Steel

EXPANSION JOINT MANUFACTURERS ASSOCIATION (EJMA)

EJMA-01 (1993) EJMA Standards

HYDRONICS INSTITUTE (HYI)

HYI-01 (1994) I=B=R Ratings for Boilers, Baseboard Radiation and Finned Tube (Commercial) Radiation

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

MSS SP-25 (1993) Standard Marking System for Valves, Fittings, Flanges and Unions

MSS SP-58 (1993) Pipe Hangers and Supports - Materials, Design and Manufacture

MSS SP-69 (1991) Pipe Hangers and Supports - Selection and Application

MSS SP-70 (1990) Cast Iron Gate Valves, Flanged and Threaded Ends

MSS SP-71 (1990) Cast Iron Swing Check Valves, Flanged and Threaded Ends

MSS SP-80 (1987) Bronze Gate, Globe, Angle and Check Valves

MSS SP-85 (1994) Cast Iron Globe & Angle Valves, Flanged and Threaded Ends

NATIONAL ASSOCIATION OF PLUMBING-HEATING-COOLING CONTRACTORS (NAPHCC)

NAPHCC-01 (1993; Supple 1994) National Standard Plumbing Code (Non-Illustrated Edition)

UNDERWRITERS LABORATORIES (UL)

UL 94

(1991; Rev thru May 1994) Tests for
Flammability of Plastic Materials for
Parts in Devices and Appliances

1.2 GENERAL REQUIREMENTS

1.2.1 Standard Products

Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of the products and shall essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening. Equipment shall be supported by a service organization that is, in the opinion of the Contracting Officer, reasonably convenient to the site.

1.2.2 Nameplates

Each major item of equipment shall have the manufacturer's name, address, type or style, model or serial number, and catalog number on a plate secured to the item of equipment.

1.2.3 Prevention of Rust

Unless otherwise specified, surfaces of ferrous metal subject to corrosion shall be factory prime painted with a rust inhibiting coating and subsequently factory finish painted in accordance with the manufacturer's standard practice. Equipment exposed to high temperature when in service shall be prime and finish painted with the manufacturer's standard heat resistant paint to a minimum thickness of 0.025 mm (1 mil).

1.2.4 Equipment Guards and Access

Belts, pulleys, chains, gears, couplings, projecting setscrews, keys, and other rotating parts exposed to personnel contact shall be fully enclosed or guarded. High temperature equipment and piping exposed to contact by personnel or where a fire hazard will be created shall be properly guarded or covered with insulation of a type specified. Items such as catwalks, operating platforms, ladders, and guardrails shall be provided where shown and shall be constructed in accordance with Section 05500 MISCELLANEOUS METAL.

1.2.5 Verification of Dimensions

The Contractor shall become familiar with all details of the work, verify all dimensions in the field, and shall advise the Contracting Officer of any discrepancy before performing any work.

1.2.6 Welding

Piping shall be welded in accordance with qualified procedures using performance-qualified welders and welding operators. Procedures and welders shall be qualified in accordance with ASME BPV IX. Welding procedures qualified by others, and welders and welding operators qualified by another employer may be accepted as permitted by ASME B31.1. The Contracting Officer shall be notified 24 hours in advance of tests and the tests shall be performed at the work site if practical. The welder or welding operator shall apply his assigned symbol near each weld he makes as a permanent record. Structural members shall be welded in accordance with

Section 05055 WELDING, STRUCTURAL.

1.2.7 Manufacturer's Services

Services of a manufacturer's representative who is experienced in the installation, adjustment, and operation of the equipment specified shall be provided. The representative shall supervise installing, adjusting, and testing the equipment.

1.2.8 Field Training

Contractor shall conduct a training course for the maintenance and operating staff. The training period of 8 hours normal working time shall start after the system is functionally complete but before the final acceptance tests. The training shall include all of the items contained in the approved operating and maintenance instructions as well as demonstrations of routine maintenance operations. Contracting Office shall be given at least 2 weeks advance notice of such training.

1.2.9 Use of Asbestos Products

Products which contain asbestos are prohibited. This prohibition includes items such as packings or gaskets, even though the item is encapsulated or the asbestos fibers are impregnated with binder material.

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL PROCEDURES:

SD-01 Data

Welding; FIO. Heating and Utilities System; FIO.

A copy of qualified procedures and a list of names and identification symbols of qualified welders and welding operators.

Spare parts data for each item of equipment provided, after approval of the drawings and not later than 2 months before the date of beneficial occupancy. The data shall include a complete list of spare parts and supplies, with current unit prices and supplies, with current unit prices and supply sources.

SD-04 Drawings

Heating and Utilities System; FIO.

Detail drawings consisting of schedules, performance charts, brochures, diagrams, drawings, and instructions necessary for installation of the systems as specified. Detail drawings for pumping units and appurtenances, including controls. Drawings shall indicate clearances required for maintenance and operation and shall also contain complete wiring and schematic diagrams, equipment layout and anchorage, and any other details required to demonstrate that the system has been coordinated and will properly function as a unit.

Pipe Anchors; FIO.

Detailed drawings of pipe anchors, before installation.

SD-06 Instructions

Framed Instructions; FIO.

Proposed diagrams, instructions, and other sheets, before posting.

SD-09 Reports

Adjusting, Balancing, Testing and Inspection; FIO.

Test reports in booklet form showing all field tests performed to adjust each component and all field tests performed to prove compliance with the specified performance criteria, upon completing and testing the system. Each test report shall indicate the final position of controls.

SD-19 Operation and Maintenance Manuals

Heating and Utilities System; FIO.

Six complete copies of operation manuals outlining the step-by-step procedures required for system startup, operation, and shutdown. The manuals shall include the manufacturer's name, model number, service manual, parts list, and a brief description of all equipment and their basic operating features. Six complete copies of maintenance manuals listing routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guides. The manuals shall include piping layout, equipment layout, and simplified wiring and control diagrams of the system as installed.

1.4 DELIVERY AND STORAGE

All equipment delivered and placed in storage shall be stored with protection from weather, humidity and temperature variations, dirt and dust, or other contaminants.

PART 2 PRODUCTS

2.1 MATERIALS

Materials shall conform to the following:

2.1.1 Pipe and Pipe Fittings

2.1.1.1 Adapters

Adapters for copper tubing shall be brass or bronze for soldered fittings.

2.1.1.2 Cast Iron Pipe Fittings

ASME B16.1 or ASME B16.4, Class 125, type to match adjacent piping.

2.1.1.3 Fittings for Brass or Copper Pipe

ASME B16.15, Class A or B.

2.1.1.4 Fittings for Copper Tubing

Cast or wrought bronze or wrought copper, soldered-joint, brazed-joint, or flared-joint type, as specified, completely fabricated at the factory. Bronze threaded fittings shall conform to the applicable requirements of ASME B16.15. Cast copper alloy solder joint pressure fittings shall conform to ASME B16.18. Fittings on Type L tubing shall be brazed-joint type of cast or wrought bronze or wrought copper. Fittings on Type K tubing shall be cast bronze flared joint type. Extracted brazed tee joints produced with an acceptable tool and installed as recommended by the manufacturer may be used.

2.1.1.5 Malleable Iron Pipe Fittings

ASME B16.3, type required to match adjacent piping.

2.1.1.6 Nipples

ASTM A 733, standard weight.

2.1.1.7 Pipe

ASTM A 53 or ASTM A 106, Grade A or B, black steel. Pipe shall be standard weight unless otherwise specified.

2.1.1.8 Welding Fittings for Pipe

ASME B16.9.

2.1.1.9 Pipe Flanges and Flanged Fittings

Steel flanges, ASTM A 181 and ASME B16.5. Convolute flanges shall mate with ASME B16.5, Class 150 flanges. Flanges and fittings shall have the manufacturer's trademark affixed in accordance with MSS SP-25 so as to permanently identify the manufacturer.

2.1.1.10 Pipe Hangers, Inserts, and Supports

MSS SP-58 and MSS SP-69.

2.1.1.11 Pipe Threads

ASME B1.20.1.

2.1.1.12 Solder, Silver

AWS A5.8.

2.1.1.13 Unions

ASME B16.39, type to match adjacent piping.

2.1.1.14 Gaskets

ASME B16.21. Approved metallic self-centering style and ring style gasket consisting of metallic retainer and sealing gland may be used for intended service.

2.1.2 Valves

2.1.2.1 Check Valves

- a. Sizes 80 mm (3 inches) and less, bronze: MSS SP-80, Type 3 or 4, Class 125.
- b. Sizes 50 mm (2 inches) through 600 mm (24 inches), cast iron: MSS SP-71, Type III or IV, Class 125.

2.1.2.2 Globe Valves

- a. Sizes 80 mm (3 inches) and less, bronze: MSS SP-80, Type 1, 2, and 3, Class 125.
- b. Sizes 50 mm (2 inches) through 300 mm (12 inches), cast iron: MSS SP-85, Type III, Class 125.

2.1.2.3 Gate Valves

- a. Sizes 80 mm (3 inches) and less, bronze: MSS SP-80, Type 1 or 2, Class 125.
- b. Sizes 50 mm (2 inches) through 1200 mm (48 inches), cast iron: MSS SP-70, Type I, Class 125, Design OT or OF (OS & Y), bronze trim.

2.2 ELECTRICAL WORK

Electrical motor driven equipment specified shall be provided complete with motors, motor starters, and controls. Electrical equipment and wiring shall be in accordance with Section 16415 ELECTRICAL WORK, INTERIOR. Electrical characteristics shall be as specified or indicated. Unless otherwise indicated, motors of 746 watt (1 hp) and above shall be high efficiency type. Motor starters shall be provided complete with thermal overload protection and other appurtenances necessary for the motor control specified. Each motor shall be of sufficient size to drive the equipment at the specified capacity without exceeding the nameplate rating of the motor. Manual or automatic control and protective or signal devices required for the operation specified, and any control wiring required for controls and devices but not shown, shall be provided.

2.3 SYSTEM EQUIPMENT

2.3.1 Condensate Pumping Unit

Each pump shall have a minimum capacity of 0.18 liters per second when discharging against the specified pressure. Minimum capacity of the tank shall be 58.6 liters. Condensate pumping unit shall be of the duplex, vertical-shaft type. Unit shall consist of two pumps two electric motors and a single receiver. Pump shall be centrifugal or turbine type, bronze-fitted throughout, with impellers of bronze or other corrosion-resistant metal. Pumps shall be free from air-binding when handling condensate up to 95 degrees C (200 degrees F). Pumps shall be connected directly to drip-proof enclosed motors. Receiver shall be cast iron and shall be provided with condensate return, vent, overflow, and pump suction connections, water level indicator and automatic air vent. Strainer shall be provided in the inlet line to tank. Vent pipe shall be galvanized steel, and the fittings shall be galvanized malleable iron. Vent pipe shall be installed as indicated. Vent piping shall be flashed as specified. Pump, motor, and receiving tank may be mounted on a single base

with the receiver pipe to the pump suction. A gate valve and check valve shall be provided in the discharge connection from each pump. Enclosed float switches complete with float mechanism shall be installed in the head of the receiver. Each condensate pump shall be controlled automatically by means of the respective float switch that will automatically start or stop the motor when the water in the receiver reaches the high or low level respectively. Motors shall be provided with magnetic across-the-line starters equipped with general purpose enclosure and "Automatic-Manual-Off" selector switch in the cover. Automatic alternator shall be provided for duplex units.

2.4 Control Valves and Controllers

2.4.1 Pressure-Reducing Valves

Valves designed for a working pressure of not less than 860 kPa (125 psig) shall be provided where indicated or otherwise required. Each reducing valve shall be adjusted to maintain the desired terminal pressure within 20 kPa (3 psi), regardless of fluctuations in the initial pressure. Valves shall be quiet in operation. Reducing valves provided in lines for space heating only shall be of the double disk and seat type or sliding gate and plate type. Reducing valves for dead-end service shall be single-seated or sliding gate and plate type. Parts subject to wear shall be constructed of noncorrodible metal and shall be easily replaceable.

2.5 Flash Tank

Tank shall be sized and installed as indicated and shall be of welded construction utilizing black steel sheets not less than 3 mm (0.1196 inches) thick. Tank shall be provided with a handhole and with tapping for the condensate returns, drip lines, vent line, and condensate discharge line. Discharge line shall be equipped with a float trap. Vent pipe shall be of galvanized steel and fittings shall be of galvanized malleable iron. Vent pipe shall be installed as indicated. Vent piping shall be flashed as specified.

2.6 Steam Traps

2.6.1 Float Traps

Capacity, working pressure, and differential pressure of the traps shall be as indicated.

2.6.2 Float-and-Thermostatic Traps

Traps shall be designed for a steam working pressure of approximately 105 kPa (15 psig), but shall operate with a supply pressure of approximately 35 kPa (5 psig). Capacity of the traps shall be as indicated. Trap capacity shall be based on a pressure differential of 2 kPa (1/4 psig). Each float-and-thermostatic trap shall be provided with a hard-bronze, monel, or stainless steel valve seat and mechanism and brass float, easily removable for inspection or replacement without disturbing the piping connections. Inlet to each trap shall have a cast-iron strainer, either an integral part of the trap or a separate item of equipment.

2.6.3 Bucket Traps

Traps shall be inverted or vertical bucket type with automatic air discharge. Traps shall be designed for a working pressure of 1.03 MPa (150

psig), but shall operate under a steam supply pressure of approximately 275 kPa (40 psi) to 690 kPa (100 psig). Each trap shall have a heavy body and cap of fine-grained, gray cast iron. Bucket shall be made of brass; the mechanism of hard bronze; the valve and seat of stainless or monel; or each of equivalent material. Traps shall be tested hydrostatically under a pressure of 1.5 MPa (200 psig). Traps shall have capacities as indicated when operating under the specified working conditions. Strainer shall be provided on the inlet connection of each trap. Impact-operated traps, impulse-operated traps, or thermodynamic traps with continuous discharge may be installed in lieu of bucket traps, subject to approval. Thermostatic traps designed for a steam working pressure suitable for the application may be furnished in lieu of the traps specified above. Thermostatic traps shall be equipped with valves and seats of stainless steel, or monel metal, and shall have capacities based on a pressure differential not in excess of the following:

2.7 SPACE HEATING EQUIPMENT

2.7.1 Heating and Ventilating Units

See section: AIR SUPPLY AND DISTRIBUTION SYSTEM 15805

2.8 SYSTEM ACCESSORIES

2.8.1 Foundations and Anchorage

Foundations and anchorage for pumping units and for other heating equipment shall be in accordance with the manufacturer's requirements.

2.8.2 Pressure Gauges and Thermometers

Gauges shall be provided for piping as indicated. Gauges shall comply with ASME B40.1 and thermometers shall comply with ASME PTC 19.3. A thermometer and pressure gauge shall be provided on the steam supply and return mains. Thermometers shall be separable socket type.

2.8.3 Vacuum Relief Valve

An approved vacuum relief valve shall be installed where indicated. On shutoff of steam supply and condensing of steam, the vacuum relief valve shall automatically admit air to the system.

2.8.4 Safety Valves

Pop safety valves shall be provided on the low side of each pressure reducing valve. The valves shall be set to open automatically and to relieve steam at 35 kPa (5 psi) in excess of the setting of the reducing valve, or as indicated. Safety valves shall conform to the requirements of ASME BPV VIII Div 1 and shall be installed as indicated.

2.8.5 Drains

A drain connection with 25 mm (1 inch) gate valve or 20 mm (3/4 inch) hose bib shall be installed at the lowest point in the return main. In addition, threaded drain connections with threaded cap or plug shall be installed wherever required for thorough draining of the steam system.

2.9 PIPING AND ACCESSORIES

2.9.1 Pipe and Fittings

2.9.1.1 Steam Piping and Fittings

Piping shall be black steel, conforming to ASTM A 53, Grade A. Fittings shall be black, malleable iron or steel. Fittings adjacent to valves shall suit valves specified. Reducing fittings shall be used for changes in pipe sizes. In horizontal steam lines, reducing fittings shall be the eccentric type to maintain the bottom of the lines at the same level.

2.9.1.2 Condensate Return Piping and Fittings

Piping shall be black steel, extra strong weight, conforming to ASTM A 53, Grade A. Fittings shall be cast iron or malleable iron, extra heavy.

2.9.1.3 Vent Piping and Fittings

Piping shall be black steel, conforming to ASTM A 53, Grade A. Fittings shall be black malleable iron to suit piping.

2.9.1.4 Gauge Piping

Piping shall be copper tubing, Type K or L, for steam and condensate 170 kPa (25 psig) and less and steel for greater than 170 kPa (25 psig).

2.9.2 Joints

Except as otherwise specified, fittings used on steel pipe shall be threaded for fittings 25 mm (1 inch) and smaller; threaded or welded for fittings 32 mm (1-1/4 inches) up through 65 mm (2-1/2 inches); and flanged or welded for fittings 80 mm (3 inches) and larger. Joints between sections of copper tubing or pipe shall be flared or sweated. Pipe and fittings 32 mm (1-1/4 inches) and larger and installed in inaccessible conduits or trenches beneath concrete floor slabs shall be welded. Unless otherwise specified, connections to equipment shall be made with black malleable iron unions for pipe 65 mm (2-1/2 inches) or smaller in diameter, and with flanges for pipe 80 mm (3 inches) or more in diameter.

2.9.2.1 Dielectric Unions

Unions shall conform to the tensile strength and dimensional requirements specified in ASME B16.39. Unions shall have metal connections on both ends to match adjacent piping. Metal parts of dielectric unions shall be separated with nylon insulators to prevent current flow between dissimilar metals. Unions shall be suitable for the required operating pressure and temperatures.

2.9.3 Strainers

Basket or Y-type strainers shall be the same size as the pipelines in which they are installed. The strainer bodies shall be cast-iron rated for Class 125 service, with bottoms drilled and plugged. Bodies shall have arrows cast on the sides to indicate the direction of flow. Each strainer shall be equipped with a removable cover and sediment basket. Basket shall not be less than 0.76 mm (22 gauge) and shall have perforations to provide a net free area through the basket of at least four times that of the entering pipe.

2.10 SEQUENCE OF AUTOMATIC CONTROLS

Sequence of automatic controls shall be as specified in Section 15950 HEATING, VENTILATING AND AIR CONDITIONING HVAC CONTROL SYSTEMS.

2.11 FACTORY COATING

Radiator and convector enclosures shall be coated with the manufacturer's standard rust inhibiting primer. Other equipment and component items, when fabricated from ferrous metal, shall be factory finished with the manufacturer's standard finish.

PART 3 EXECUTION

3.1 INSTALLATION

All work shall be installed as indicated and in accordance with the manufacturer's diagrams and recommendations.

3.1.1 Piping

Unless otherwise specified, pipe and fitting installation shall conform to the requirements of ASME B31.1. Pipe shall be cut accurately to measurements established at the jobsite and worked into place without springing or forcing, completely clearing all windows, doors, and other openings. Cutting or other weakening of the building structure to facilitate piping installation will not be permitted without written approval. Piping or tubing shall be cut square, shall have burrs removed by reaming, and shall be so installed as to permit free expansion and contraction without causing damage to building structure, pipe, joints, or hangers. Filings, dust, or dirt shall be wiped from interior of the pipe or tubing before connections are made. Changes in direction shall be made with fittings, except that bending of pipe up to 100 mm (4 inches) size will be permitted, provided a pipe bender is used and wide sweep bends are formed. The center line radius of bends shall not be less than six diameters of the pipe. Bent pipe showing kinks, wrinkles, flattenings, or other malformations will not be accepted. Vent pipes shall be installed through the roof as directed and shall be flashed as specified. Horizontal supply mains shall pitch up or down in the direction of flow as indicated. The grade shall be not less than 25 mm in 12 m. Reducing fittings shall be used for changes in pipe sizes. Open ends of pipelines and equipment shall be capped or plugged during installation to keep dirt or other foreign materials out of the systems. Pipe not otherwise specified shall be uncoated. Unions for copper pipe or tubing shall be brass or bronze. Connections between ferrous piping and copper piping shall be electrically isolated from each other with dielectric unions.

3.1.1.1 Threaded Joints

Threaded joints shall be made with tapered threads properly cut, and shall be made tight with polytetrafluoroethylene (PTFE) tape complying with ASTM D 3308, or equivalent joint compound applied to the male threads only, and in no case to the fittings.

3.1.1.2 Welded Joints

Welded joints shall be fusion-welded unless otherwise required. Changes in direction of piping shall be made with welding fittings only. Branch connection may be made with either welding tees or forged branch outlet

fittings. Branch outlet fittings shall be forged, flared for improvement of flow where attached to the run, and reinforced against external strains. Beveling, alignment, heat treatment, and inspection of weld shall conform to ASME B31.1. Weld defects shall be removed and repairs made to the weld, or the weld joints shall be entirely removed and rewelded at no additional cost to the Government. Electrodes shall be stored and dried in accordance with AWS D1.1 or as recommended by the manufacturer. Electrodes that have been wetted or that have lost any of their coating shall not be used.

3.1.1.3 Flanges and Unions

Flanges and unions shall be faced true, and made square and tight. Gaskets shall be nonasbestos compressed material in accordance with ASME B16.21, 1.6 mm (1/16 inch) thickness, full face or self-centering flat ring type. The gaskets shall contain aramid fibers bonded with styrene butadiene rubber (SBR) or nitrile butadiene rubber (NBR). NBR binder shall be used for hydrocarbon service. Union or flange joints shall be provided in each line immediately preceding the connection to each piece of equipment or material requiring maintenance such as coils, pumps, control valves, and other similar items.

3.1.1.4 Flared and Sweated Pipe and Tubing

Flared and sweated pipe and tubing shall be cut square and burrs shall be removed. Both inside of fittings and outside of tubing shall be cleaned with an abrasive before sweating. Care shall be taken to prevent annealing of fittings and hard drawn tubing when making connection. Installation shall be made in accordance with the manufacturer's recommendations. Mitering of joints for elbows and notching of straight runs of pipe for tees will not be permitted. Joints for soldered fittings shall be made with silver solder. Joints for flared-type fittings shall be provided on all branch connections, mains, and risers to provide for expansion and contraction of the pipe without stress to fittings, pipe, or tubing.

3.1.1.5 Copper Tube Extracted Joint

An extracted mechanical tee joint may be used in copper tube. Joint shall be produced with an appropriate tool by drilling a pilot hole and drawing out the tube surface to form a collar having a minimum height of three times the thickness of the tube wall. To prevent the branch tube from being inserted beyond the depth of the extracted joint, dimpled depth stops shall be provided. The branch tube shall be notched for proper penetration into fitting to ensure a free flow joint. Joints shall be brazed in accordance with the NAPHCC-01. Soldered joints will not be permitted.

3.1.2 Connections to Equipment

Supply and return connections shall be provided by the Contractor unless otherwise indicated. Valves and traps shall be installed in accordance with the manufacturer's recommendations. Unless otherwise indicated, the size of the supply and return pipes to each piece of equipment shall not be smaller than the equipment connections. Steam and return connections, unless otherwise indicated, shall be made with malleable iron unions for piping 65 mm (2-1/2 inches) or less in diameter and with flanges for pipe 80 mm (3 inches) or more in diameter.

3.1.3 Branch Connections

Branches shall pitch up or down as indicated, unless otherwise specified.

Connection shall be made to ensure unrestricted circulation; eliminate air pockets; and permit drainage of the system. Steam supply and condensate branches taken from mains shall pitch with a grade of not less than 25 mm in 3 m, unless otherwise indicated.

3.1.4 Risers

The location of risers is approximate. Exact locations of the risers shall be as approved. Steam supply downfeed risers shall terminate in a dirt pocket and shall be drip trapped to the return.

3.1.5 Supports

3.1.5.1 General

Hangers used to support piping 50 mm (2 inches) and larger shall be fabricated to permit adequate adjustment after erection while still supporting the load. Pipe guides and anchors shall be installed to keep pipes in accurate alignment, to direct the expansion movement, and to prevent buckling, swaying, and undue strain. All piping subjected to vertical movement when operating temperatures exceed ambient temperatures, shall be supported by variable spring hangers and supports or by constant support hangers. Pipe hanger loads suspended from steel joist between panel points shall not exceed 222 Newtons. Loads exceeding 222 Newtons shall be suspended from panel points.

3.1.5.2 Pipe Supports and Structural Bracing, Seismic Requirements

Piping and attached valves shall be supported and braced to resist seismic loads as specified in Section 13080. Structural steel required for reinforcement to properly support piping, headers, and equipment but not shown shall be provided in this section. Material used for supports shall be as specified in Section 05120 STRUCTURAL STEEL.

3.1.5.3 Pipe Hangers, Inserts, and Supports

Pipe hangers, inserts and supports shall conform to MSS SP-58 and MSS SP-69, except as modified herein.

- a. Types 5, 12, and 26 shall not be used.
- b. Type 3 shall not be used on insulated pipe.
- c. Type 18 inserts shall be secured to concrete forms before concrete is placed. Continuous inserts which allow more adjustment may be used if they otherwise meet the requirements for type 18 inserts.
- d. Type 19 and 23 C-clamps shall be torqued per MSS SP-69 and have both locknuts and retaining devices, furnished by the manufacturer. The C-clamp body shall not be constructed from bent plate.
- e. Type 20 attachments used on angles and channels shall be furnished with an added malleable iron heel plate or adapter.
- f. Type 24 may be used only on trapeze hanger systems or on fabricated frames.
- g. Where type 39 saddle or type 40 shield are permitted for a

particular pipe attachment application, the type 39 saddle welded to the pipe, shall be used on all pipe 100 mm (4 inches) and larger when the temperature of the medium is 16 degrees C (60 degrees F) or higher. Type 40 shields shall be used on all piping less than 100 mm (4 inches) and all piping 100 mm (4 inches) and larger carrying medium less than 16 degrees C (60 degrees F). A high density insulation insert of a density 130 kg per cubic meter (8 pcf) or greater shall be used under the type 40 shield for piping 50 mm (2 inches) and larger.

- h. Horizontal pipe supports shall be spaced as specified in MSS SP-69 and a support shall be installed not over 300 mm from the pipe fitting joint at each change in direction of the piping. Pipe supports shall be spaced not over 1.5 m apart at valves. In the support of multiple pipe runs on a common base member, a clip or clamp shall be used where each pipe crosses the base support member. Spacing of the base support members shall not exceed the hanger and support spacing required for any of the individual pipes in the multiple pipe run. The clips or clamps shall be rigidly connected to the common base member. A clearance of 3 mm shall be provided between the pipe and clip or clamp for all piping which may be subjected to thermal expansion.
- i. Vertical pipe shall be supported at each floor, except at slab-on-grade, and at intervals of not more than 4.5 m, not more than 2.4 m from end of risers, and at vent terminations.
- j. Type 35 guides using steel, reinforced PTFE or graphite slides shall be provided where required to allow longitudinal pipe movement. Lateral restraints shall be provided as required. Slide materials shall be suitable for the system operating temperatures, atmospheric conditions, and bearing loads encountered.

(1) Where steel slides do not require provisions for restraint of lateral movement, an alternate guide method may be used. On piping 100 mm (4 inches) and larger carrying medium 16 degrees C (60 degrees F) or higher, a type 39 saddle may be welded to the pipe and freely rest on the steel plate. On piping under 100 mm (4 inches) and piping 100 mm (4 inches) and larger carrying medium less than 16 degrees C (60 degrees F) a type 40 protection shield may be attached to the pipe or insulation and freely rest on a steel plate. A high density insulation insert of density 130 kg per cubic meter (8 pcf) or greater shall be used under all shields on piping 50 mm (2 inches) and larger.

(2) Where there are high system temperatures and welding to piping is not desirable, then the type 35 guide shall include a pipe cradle, welded to the guide structure and strapped securely to the pipe. The pipe shall be separated from the slide material by at least 100 mm, or by an amount adequate for the insulation, whichever is greater.

- k. Pipe hangers on horizontal insulated pipe shall be the size of the outside diameter of the insulation. The insulation shall be continuous through the hanger on all pipe sizes and applications.
- l. Piping in trenches shall be supported as indicated.

3.1.6 Pipe Sleeves

Pipe passing through concrete or masonry walls or concrete floors shall be provided with pipe sleeves fitted into place at the time of construction. Sleeves shall not be installed in structural members except where indicated or approved. Rectangular and square openings shall be as detailed on the drawings. Each sleeve shall extend through its respective wall, floor and shall be cut flush with each surface. Unless otherwise indicated, sleeves shall be of such size as to provide a minimum of 6 mm all around clearance between sleeve and bare pipe or insulation surface. Sleeves in bearing walls, waterproofing membrane floors, and wet areas shall be steel pipe or cast-iron pipe. Sleeves in nonbearing walls, floors may be steel pipe, cast-iron pipe, or galvanized sheet metal with lock-type longitudinal seam and of the metal thickness indicated. Except in pipe chases or interior walls, the annular space between pipe and sleeve or between jacket over insulation and sleeve in nonfire-rated walls and floors shall be sealed as indicated and specified in Section 07920 JOINT SEALING and in fire-rated walls and floors shall be as indicated and specified in Section 07270 FIRESTOPPING. Pipes passing through wall waterproofing membrane shall be sleeved as described above. In addition, a waterproofing clamping flange shall be installed as indicated.

3.1.7 Anchors

Anchors shall be provided where necessary or indicated to localize expansion or prevent undue strain on piping. Anchors shall consist of heavy steel collars with lugs and bolts for clamping and attaching anchor braces, unless otherwise indicated. Anchor braces shall be installed using turnbuckles where required. Supports, anchors, or stays shall be located to prevent damage by installation operations or by the weight or expansion of the pipeline.

3.1.8 Valves and Equipment

Valves shall be installed at the locations shown, where specified, and where required for the proper functioning of the system as directed. Gate valves shall be used unless otherwise shown, specified, or directed. Valves shall be installed with their stems horizontal or above. Valves used with ferrous piping shall have threaded or flanged ends for ferrous piping and sweat-type connections for copper tubing.

3.1.8.1 Thermometer Socket

A thermometer well shall be provided in each return line circuit in multicircuit systems.

3.1.8.2 Steam Air Vents

Vents shall be installed where indicated on Sheets M2.0 and M5.0. Discharge pipes from the vent shall be run to a point as indicated on Sheet M5.0.

Vent shall be a quick-acting valve that continuously removes air. Valve shall be constructed of corrosion-resisting metal, shall be designed to withstand the maximum piping system pressure, and shall automatically close tight to prevent escape of steam and condensate. Vent shall be provided with a manual isolation valve.

3.1.8.3 Pressure Reducing Valves

Valves designed for a working pressure of not less than 860 kPa (125 psig) shall be provided wherever indicated or required. Each valve shall be installed with a strainer, a three-valve bypass, and a safety valve.

3.1.9 Steam Traps

Float traps shall be installed in the condensate-discharge line from the flash tank and elsewhere as indicated. All other steam traps shall be installed where indicated.

3.1.10 Insulation

Thickness and application of insulation materials for piping and equipment shall be in accordance with Section 15250 THERMAL INSULATION FOR MECHANICAL SYSTEMS.

3.2 ADJUSTING, BALANCING, TESTING AND INSPECTING

3.2.1 Field Tests

The Contractor shall notify the Contracting Officer 30 days before the performance and acceptance tests are to be conducted. The tests shall be performed in the presence of the Contracting Officer. The Contractor shall furnish all instruments and personnel required for the tests. Electricity, steam, and water will be furnished by the Government.

3.2.1.1 Piping

Before thermal insulation is installed, the entire heating system, including all heating units, valves and fittings, shall be hydrostatically tested at 1-1/2 times the design operating pressure for a minimum of 4 hours.

3.2.2 Cleaning and Adjusting

After hydrostatic tests have been made and prior to the operating tests, piping shall be thoroughly cleaned by filling the system with a solution of 0.45 kg of caustic soda or 1.4 kg (3 pounds) of trisodium phosphate per 380 liters (100 gallon) of water. The water shall be heated to approximately 65 degrees C (150 degrees F), and the solution circulated in the system for a period of 48 hours, then drained and thoroughly flushed out with fresh water. Equipment shall be wiped clean, with all traces of oil, dust, dirt, or paint spots removed. The Contractor shall be responsible for maintaining the system in a clean condition until final acceptance. Bearings shall be lubricated as recommended by the manufacturer. Belts shall be adjusted with correct tension, and other miscellaneous equipment shall be adjusted to setting indicated or as recommended by the respective manufacturers.

3.2.3 System Operation

Upon completion and prior to acceptance of the project, the installation shall be subjected to such operating tests as may be required to demonstrate that the steam heating system will operate as specified or indicated. Tests shall be conducted by a qualified test engineer at such times as directed. The Contractor shall provide instruments, facilities, and labor required to conduct the tests. Indicating instruments shall be read at 1/2-hour intervals, unless otherwise directed. Tests shall cover a period of 3 or more hours for each system tested, and test reports shall

include the following applicable specific information together with conclusions as to the adequacy of the system:

Time, date, and duration of test.

Flow and pressure of steam to the inlet of the equipment.

Make, model, and size of each piece of equipment.

Dry bulb temperature entering and leaving heating and ventilating units.

Static discharge pressure actually obtained, total cfm handled, and voltmeter and ammeter readings for fan motor during operation.

Heating output for space-heating equipment.

Capacity and discharge pressure of each pump.

Automatic control sequence and operation.

3.2.4 Balancing

Systems shall be completely balanced by a qualified engineer. A complete balancing procedure shall be submitted for approval. All required piping, valves, and connections required to balance the systems shall be provided.

Balancing of air systems shall be as specified in Section 15895 AIR SUPPLY, DISTRIBUTION, VENTILATION, AND EXHAUST SYSTEM.

3.2.5 Retesting

Any deficiencies revealed during testing shall be corrected and tests shall be reconducted.

3.3 FIELD PAINTING

Painting required for surfaces not otherwise specified, and finish painting of items only primed at the factory, are specified in Section 09900 PAINTING, GENERAL.

-- End of Section --

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DIVISION 15 - MECHANICAL

SECTION 15704

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SECTION 15704

HOT GLYCOL DISTRIBUTION SYSTEMS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B16.1	(1989) Cast Iron Pipe Flanges and Flanged Fittings
ASME B16.21	(1992) Nonmetallic Flat Gaskets for Pipe Flanges
ASME B16.3	(1992) Malleable Iron Threaded Fittings
ASME B16.4	(1992) Gray Iron Threaded Fittings
ASME BPV VIII Div 1	(1995; Addenda Dec 1995) Boiler and Pressure Vessel Code; Section VIII, Pressure Vessels Division 1 - Basic Coverage

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 53	(1993a) Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless
ASTM A 234	(1996) Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures
ASTM A 276	(1996) Stainless and Heat-Resisting Steel Bars and Shapes
ASTM C 552	(1991) Cellular Glass Thermal Insulation
ASTM D 3139	(1989; R 1995) Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
ASTM F 477	(1995) Elastomeric Seals (Gaskets) for Joining Plastic Pipe

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTING INDUSTRY (MSS)

MSS SP-58	(1993) Pipe Hangers and Supports - Materials, Design and Manufacture
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MSS SP-69

(1996) Pipe Hangers and Supports -
Selection and Application

NATIONAL SANITATION FOUNDATION (NSF)

NSF Std 14

(1965; Rev Nov 1990) Plastics Piping
System Components and Related Materials

FEDERAL SPECIFICATIONS (FS)

FS HH-I-558

(Rev C) Insulation, Blankets, Thermal
(Mineral Fiber, Industrial Type) \N\CCB

1.2 General REQUIREMENTS

This section covers the furnishing and installation of the hot glycol distribution system. The contract drawings show the general arrangement of piping, sizes and grades of pipe, and other details. Expansion elbows or loops and associated anchors shown on the drawings may not be necessary if a nonmetallic piping system with adequate integral expansion capability is provided. In all cases, the Contractor shall provide detailed drawings prior to installation work and shall clearly identify any proposed deviations from the requirements of the contract documents.

1.3 Standard Products

Material and equipment shall be a standard product of a manufacturer regularly engaged in the manufacture of the product and shall essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening. The Contractor shall provide documented certification of the 2-year satisfactory operation when directed to do so by the Contracting Officer.

1.4 Verification of Dimensions

The Contractor shall become familiar with all details of the work, verify all dimensions in the field and shall advise the Contracting Officer of any discrepancy before performing the work.

1.5 Welding

Piping shall be welded in accordance with qualified procedures using performance-qualified welders and welding operators. Procedures and welders shall be qualified in accordance with ASME BPV IX. Welding procedures qualified by others, and welders and welding operators qualified by another employer may be accepted as permitted by ASME B31.1. The Contracting Officer shall be notified 24 hours in advance of tests and the tests shall be performed at the work site if practical. The Contracting Officer shall be furnished with a copy of qualified procedures and a list of names and identification symbols of qualified welders and welding operators. The welder or welding operator shall apply his assigned symbol near each weld he makes as a permanent record. Structural members shall be welded in accordance with SECTION: WELDING, STRUCTURAL.

1.6 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-04 DATA

Drawings; FIO.

Shop Drawings: Shop drawings shall be submitted in accordance with the SPECIAL CLAUSES and shall consist of a complete list of equipment and materials, including manufacturer's descriptive and technical literature, performance charts and curves, catalog cuts, and installation instructions. Shop drawings shall also contain complete piping, wiring, and schematic diagrams and any other details to demonstrate that the system has been coordinated and will properly function as a unit. Drawings shall show proposed layout and anchorage of equipment and appurtenances, and equipment relation ship to other parts of the work including clearances required for maintenance and operation.

SD-13 Certificates

Certification; FIO.

Certification Requirements: Th: Contractor shall submit to the Contracting Officer the manufacturer's or system fabricator's written certification stating that the piping system furnished meets all the requirements of this specification.

SD-19 Operation and Maintenance Manuals

Glycol Distribution Systems;FIO

The Contractor shall furnish the Contracting Officer complete copies of operating instructions outlining the step-by-step procedures required for system start up, operation and shutdown. The instructions shall include the manufacturer's name, model number, service manual, parts, list, and brief description of all equipment and their basic operating features.

The Contractor shall furnish the Contracting Officer complete copies of maintenance instructions listing routine maintenance procedures, possible breakdowns and repairs, and trouble shooting guides. The instructions shall include piping layout, equipment layout and simplified wiring and control diagrams of the system as installed.

1.6.1 MANUFACTURERS SERVICES

For all concrete embedded glycol piping, the Contractor shall obtain the services of a trained representative of the snow melting system manufacturer to instruct the Contractor's work forces in the installation procedures to ensure that the system is installed in accordance with the manufacturer's instructions and the plans and specifications. The manufacturer's representative shall be a person who is regularly engaged in providing such services for the manufacturer. The Contractor shall furnish the Contracting Officer a list of names of personnel trained by the snow melting system manufacturer in the installation of this system. Only personnel whose names appear on the list will be allowed to install the system. The list shall not be more than 1 year old.

PART 2 PRODUCTS

2.1 Pipin and Casing Materials

2.1.1 General

Metallic pressure pipe, fittings, and piping accessories shall conform to the requirements of ASME B31.1 and shall be types suitable for the temperature and pressure of the glycol. All piping in valve pits shall be steel with joints welded or flanged, except that joins 2 inches and smaller may be threaded. No supports, anchors, or stays shall be attached in places where either the installation of, the movement of, or the weight of the pipe and its contents will cause damage to the construction.

2.1.2 Piping

Piping shall be suitable for working temperature of 60 degrees C and a working pressure of 207 kPa

2.1.3 Steel Pipe

Pipe,galvanized Iron and steel shall conform to ASTM A 527, ASTM A 528, or ASTM A 642, standard weight, black shall conform ASTM A 366 OR ASTM A 569. Where steel pipe shall not runs below grade, insulate pipe per specification Section 15704, Paragraph 2.11, provide with plastic vapor barrier and run in split tile. Where steel pipe runs above ground, insulate per specification Section 15704, Paragraph 2.11, and provide with aluminum jacket.

2.1.4 Polyolefin Pipe

Shall conform to applicable ASTM standards and have a Plastic Pipe Institute approved hydrostatic stress rating for use-at 60 degrees C Pipe shall be marked SNOW MELTING SYSTEM, 207 kPa at 60 degrees C.

2.2 PIPE FITTINGS

2.2.1 Steel Pipe Fittings

Steel welding fittings shall conform to ASTM A 234. Welding fittings shall conform to ASME B16.5 for butt weld fittings and ASME B16.11 for socket-weld fittings. Long radius butt welding elbows conforming to ASME B16.5 shall be used whenever space permits. Threaded fittings shall conform to ASME B16.3, Class 150.

2.2.1.1 Plastic Carrier Pipe Fittings

Fittings for pipe shall be plastic or steel. Plastic fittings shall be made of the same type and grade of material as the piping to which they will be connected and shall be furnished by the manufacturer who supplies the pipe. Fittings shall have temperature and pressure rating not less than those of the connecting piping. Steel fittings shall be as specified for steel pipe above. Joints for plastic pipe utilizing elastmeric seals shall comfor to ASTM D 3138.

2.2.2 Pipe Threads

Pipe threads shall conform to ASME B1.20.1.

2.3 Gaskets

2.3.1 Plastic Pipe Gaskets

Elastomeric seals (O-ring gaskets) shall conform to ASTM F 477, and shall be fabricated of heat resistant elastomer suitable for continuous service at 93 degrees C and certified by the manufacturer as suitable for this service.

2.3.2 Steel Pipe Gaskets

Gaskets used in mechanical joints for steel pipe systems shall be suitable for 93 degrees C and shall be certified by the manufacturer as suitable for this service.

2.4 Couplings

2.4.1 Mechanical Couplings for Steel Pipe

Mechanical couplings for steel pipe shall be the sleeve type or the type for grooved end pipe and shall provide a tight, flexible joint under all conditions including movements caused by expansion, contraction, slight settling or shifting in the ground, minor variations in trench gradients, and traffic vibrations. Coupling strength shall not be less than the connecting pipe sections. Sleeve-type coupling shall be used for joining plain end pipe sections. The sleeve coupling shall consist of one steel middle ring, two steel followers, two gaskets, and the necessary steel bolts and nuts to compress the gaskets. Grooved end pipe couplings shall consist of identical coupling sections fastened in place, using track headed bolts, to confine a molded gasket over the pipe and gap. Couplings shall be malleable iron or ductile iron.

2.4.2 Valves

2.4.2.1 Metallic Valves

Unless otherwise specified, ferrous and nonferrous valves shall meet the material, fabrication and operating requirements of MSS SP-25. Flow control valves shall be designed for each cleaning without disconnecting piping. Angle, gate, check, and globe valves shall be the type and class required. Valves 80 mm and smaller shall be all bronze, except where suitable, an iron body with bronze trim may be used. Butterfly valves shall be two-flanged, wafer, or adjustable sealing type. ASTM A 276, Type 304, Type 316, or Type 410 steel stems and bronze or corrosion-resisting steel discs shall be provided on wafer and flanged butterfly valves. The adjustable sealing butterfly valves shall have synthetic rubber seats. Butterfly valves smaller than 200 mm shall have a throttling handle with at least 7 locking positions. Larger valves shall be manually operable with totally enclosed gear operators having adjustable balance return stops and position indicators.

2.4.2.2 Plastic Valves

Plastic valves shall be as specified and furnished by the manufacturer of the plastic pipe. Valves shall be made of the same type and grade of plastic material and shall have temperature and pressure ratings at least equal to those of the connecting pipes. Valves shall be NSF approved based on NSF Std 14.

2.5 BALANCING COCKS

Balancing COCKS, 50 mm or smaller, may be bronze with threads for black steel pipe or sweat connection for copper tubing. COCKS, 25 mm or larger, may be all iron with threaded or flanged ends. The COCKS shall have a square head or similar operation device, an indicator arc, and shall be designed for 863 kPa cold-water service and suitable for 93 degrees C service. Iron COCKS may be lubricated, nonlubricated, or tetrafluoroethylene resin-coated plug valves. Instead of plug valves, ball valves may be used. Plug valves and ball valves 8 inches or larger shall be provided with totally enclosed manual gear operators with position indicators. All COCKS and valves 65 mm and larger shall have flanged ends.

2.6 Unions

Unions shall conform to ANSI B16.12, Class 150 for steel and ASME B16.15 for brass or bronze, type and material as required for the connecting piping. Plastic unions shall be the same material and shall have the same temperature and pressure rating as the connecting piping and shall be furnished by the manufacturer of the plastic pipe.Text

2.7 Pressure Gages

shall conform to ASME B40.1, style as required, with a scale range from 0 to 690 kPa and a minimum 113 mm diameter dial.

2.8 Strainers

Strainers shall conform to Mill Spec. MIL-S-16293, Class 125, Style Y, Type I or II, simplex type.

2.9 PIPE SUPPORTS

Pipe supports shall conform to MSS SP-58 and MSS SP-69.

2.10 Thermometers

Thermometers shall conform to ANSI SAMA Z236.1, type I, class 3, with wells. temperature range shall be suitable for the temperature range of the piping system provided. Thermometers shall be provided with separable corrosionresistant steel pockets.

2.11 Insulation

2.11.1 Field Applied Insulation

Field Applied Insulation: Field applied insulation for piping valves, and other piping system accessories shall be mineral fiber conforming to ASTM C 547, type III, Class 12, cellular glass or fiberglass conforming to ASTM C 552. Insulation shall be premolded, precut or job fabricated to fit and shall be removable and reusable. Thickness shall match thickness specified for adjacent piping. Insulation bands shall be 20 mm wide .125 mm stainless steel. Shrink sleeves shall be provided over casing connection joints.Text

2.11.2 Below Grade Pipe Insulation

Below grade pipe is to be run in split tile. Provide pipe with fiberglass

or cellular glass insulation per section 15250: THERMAL INSULATION FOR MECHANICAL SYSTEMS. Provide plastic vapor barrier. Refer to Section 15250 Table III for insulation thickness.

2.11.3 Glycol pipe above ground

Glycol pipe above ground shall be insulated per Section 15250: THERMAL INSULATION FOR MECHANICAL SYSTEMS and provided with an aluminum jacket. Refer to Section 15250 Table III for insulation thickness.

2.11.4 Equipment insulation

Equipment insulation shall be insulated per Section 15250: THERMAL INSULATION FOR MECHANICAL SYSTEMS and provided with a vapor barrier racket. Thickness of insulation to be as required by Section 15250.
Text

2.12 Thermostats/Snow and Ice Sensors

Outdoor air thermostat shall be two position type and shall control plus or minus 1°C of the temperature setting at the thermostat location. Snow & Ice sensors shall also be of the two position type and be installed per manufacturer's recommendations. Locking covers shall be provided for thermostats. Thermostat and sensor ranges shall be adjustable by at least 12.2°C.

PART 3 EXECUTION

3.1 Piping Systems

3.1.1 Buried Insulated Systems

Buried insulated systems shall consist of carrier pipe, insulation, plastic vapor barrier fittings and accessories as specified. Run insulated buried pipe in split tile. After installation, the split tile shall be wired shut. All joints shall be made tight with hot Asphaltum. Split tile consists of clay pipe, split into two lengths, with an inside diameter equal to the Carrier pipe outside diameter, plus the thickness of insulation. Insulation shall not be compressed by the split tile pipe.

3.2 Installation of Piping systems

Piping system furnished shall be installed in accordance with the piping system manufacturer's instructions. Piping shall be installed without springing or forcing other than what has been removed by reaming and shall be installed to permit free expansion and contraction without damage to joints or hangers. Nonmetallic pipe cut in the field shall be machined to fit couplings or joints and shall be coated or treated to match standard factory coated ends. Connections between different types of pipe and accessories shall be made with transition fittings approved by the manufacturer of the piping system. Supply and return mains shall be set in sand no less than 150 mm below concrete. Mains shall be hydraulically balanced by reverse return arrangement. Distribution manifolds shall be attached to supply and return mains at access cover locations. No pipe shall extend through expansion, construction or working joints in concrete slab. Pipe circuits shall be embedded in concrete at specified depth (see drawings). All pipe connections, fittings and distribution manifolds shall be free of concrete and arranged so as to be easily serviced by removal of access covers. Pipe system shall be bubble tight at 552 kPa air test prior

to concrete cover. Glycol heater and control equipment shall be installed with control wiring, piping and inhibited ethylene glycol furnished by the project contractor. Supply and return pipe system above ground and/or inside buildings shall be black steel insulated as required and furnished by the project contractor.

3.2.1 Pitching of Horizontal Piping

Horizontal piping shall be pitched at a grade of not less than 25 mm in 12 m toward the drain points unless otherwise indicated.

3.2.2 Open Ends

Open ends of pipelines and equipment shall be properly capped or plugged during installation to keep dirt and other foreign matter out of the system.

3.2.3 Cutting Prefabricated Piping Sections

Where prefabricated pipe sections are field cut, new end seals similar to the factory applied end seal shall be provided and installed in accordance with the manufacturer's instructions.

3.3 Joints

3.3.1 Welded Joints

Welded Joints between sections of pipe and between pipe and fittings shall be provided where specified or indicated. Branch connections shall be made with either welding tees or forged branch outlet fittings attached to the main and reinforced against external strains.

3.3.2 Flanged Joints

Flanged joints shall be provided with gaskets and made perfectly square and tight. Full-faced gaskets shall be used with cast-iron flanges and all gaskets shall be as thin as the finish of the flange face permits. gaskets shall be 7 mm-thick for 25 mm through 300 mm flanges and 8 mm thick for flanges 350 mm and larger.

3.3.3 Threaded Joints

Joints shall be made tight with polytetrafluoroethylene tape applied to the male threads only. Not more than three threads shall show after the joint is made up.

3.3.4 Mechanical Couplings

Sleeve and grooved pipe couplings shall be installed and protected against corrosion as recommended by the coupling manufacturer. Joints between nonmetallic and metallic carrier pipe shall be designed and furnished by the piping system manufacturer. The transition pieces shall be factory fabricated and shall be designed so that no field chemical welding of the carrier pipe will be required.

3.3.5 Nonmetallic Pipe Joints

Nonmetallic pipe joints shall be installed in accordance with the written

instruction of the manufacturer.

3.4 Branch Connections

Branch connections from supply and return mains shall be carefully made to ensure unrestricted circulation, eliminate air pockets, and permit complete drainage of the system. Changes in horizontal piping sizes shall be made through eccentric reducing fittings to keep bottom of pipe at the same level.

3.5 Expansion Loops

Expansion loop piping and insulation requirements shall be identical to that furnished for straight runs. Loops shall be properly designed in accordance with the allowable stress limits indicated in ASME B31.1 for the type of pipe used. Field joints shall be made in straight runs of the loops and the number shall be kept to a minimum. For steel pipe, piping shall be cold sprung one-half the calculated maximum operational expansion during field assembly. L- and Z-bends shall conform to the requirements for expansion loops specified in ANSI B31.1

3.6 Anchors

Anchor design shall be in accordance with the published data of the manufacturer and for prefabricated systems shall be factory fabricated by the prefabricated system manufacturer. In all cases, the design shall be such that water penetration, condensation, or vapor transmission will not wet the insulation.

3.7 Air Relief Valves

Air relief valves shall be sized as shown and shall be types which will release air and prevent the formation of a vacuum. The valves shall automatically release air from the lines when the lines are being filled with water. Valves shall be iron body with bronze trim, and floats shall be stainless steel. Valve pits shall be vented at all high points.

3.8 Valves

Valves shall be installed with stems between horizontal and upright. Isolation gate valves shall be installed at points indicated for isolation or sectionalizing purposes. Each valve, except check valves, shall be identified with brass tags not smaller than 50 mm in diameter secured to the valve with copper wire not lighter than 19 gage. Tags shall be stamped to identify valve by number and function.

3.9 Field Casing Closures

Field insulation and encasement of joints shall be accomplished after the visual and pressure tests specified are completed. Field insulation and encasement shall be in accordance with the manufacturer's written instructions.

3.10 Insulation and Encasement of Pipe Accessories

Flanges, couplings, unions, valves, fittings, and other pipe accessories, unless otherwise shown or approved, shall be insulated with removable factory premolded, prefabricated or field fabricated insulation. For accessories buried underground, the casing material and thickness shall be

identical to that of the adjoining casing.

3.11 Sleeves

Sleeves shall be provided whenever the piping distribution system passes through concrete or masonry walls or concrete floors. Pipe sleeves shall be fitted into place at the time of construction. Sleeves shall not be installed in structural members except integral flanges where pipes pass through waterproofing membranes. For insulated systems the insulation and casing shall be continuous through the sleeve. Clearance between sleeves and the piping or outer casing shall be approximately 8 mm all around. Flashing shall be provided where systems pass through waterproof membranes. Flashing materials and design shall conform to piping system manufacturer's requirements.

3.12 Testing

Tests shall be conducted before, during, and after installation of the system. All instruments, equipment, facilities, and labor required to properly conduct the tests shall be provided by the Contractor. Test pressure gages for a specific test shall have dials indicating not less than 1-1/2 times nor more than 2 times the test pressure. It shall be the Contractor's responsibility to make the pipe system workable at his expense.

3.13 Metallic Pipe Welds

The Contracting Officer shall radiographically examine, at Government expense, any or all field and factory welds. The radiographic testing shall be performed by an independent testing firm in accordance with ANSI B31.1. All radiographs shall be reviewed and interpreted by a Certified Level III Radiographer employed by the testing firm. Any welds found to be unacceptable shall be removed, rewelded and radiographically reexamined in accordance with the above criteria. Such repair and reexamination shall be accomplished at no cost to the Government.

3.14 Testing

Tests shall be conducted before, during, and after installation of the system. All instruments, equipment, facilities, and labor required to properly conduct the tests shall be provided by the Contractor. Test pressure gages for a specific test shall have dials indicating not less than 1-1/2 times nor more than 2 times the test pressure. It shall be the Contractor's responsibility to make the pipe system workable at his expense.

3.14.1 Metallic Pipe Welds

The Contracting Officer shall radiographically examine, at Government expense, any or all field and factory welds. The radiographic testing shall be performed by an independent testing firm in accordance with ANSI B31.1. All radiographs shall be reviewed and interpreted by a Certified Level III Radiographer employed by the testing firm. Any welds found to be unacceptable shall be removed, rewelded and radiographically reexamined in accordance with the above criteria. Such repair and reexamination shall be accomplished at no cost to the Government.

3.14.2 Carrier Piping Tests

Distribution piping shall be tested as required before backfilling and with all joints exposed. The area between joints may be backfilled as necessary

to prevent piping movement.

3.14.2.1 Cleaning Carrier Pipe

Prior to testing, the interior of the carrier pipe shall be cleaned of all foreign materials by thorough flushing with clean water. Supplementary pumps shall be provided to circulate the water at a velocity between 7 and 10 feet per second for a minimum of 4 hours. Any system strainers shall be cleaned after the flushing operation is complete. Temporary strainers shall be installed as required. After circulation, the water shall be drained out of the piping system and the piping system filled with inhibited ethylene glycol for permanent operation of the system. All air must be removed from the system prior to starting the tests.

3.14.2.2 Hydrostatic Pressure Cycling and First Hydrostatic Pressure Test

Hydrostatic pressure cycling will have four cycles. Each cycle shall consist of a 10-minute period at 552 kPa followed by a 5-minute period at a pressure less than 345 kPa. The next cycle will begin immediately following the completion of the previous cycle. Pressure rise and drop shall not exceed 552 kPa per minute. The pressure gage shall be located and the pressure measured at the opposite end of the system from where the pressure is applied. After completion of the hydrostatic pressure cycling, the first hydrostatic pressure test may be performed. During the first hydrostatic pressure test, the system shall be proven tight at a pressure of 1-1/2 times the working pressure up to 552 kPa. This pressure shall be held for a minimum of 1 hour. The method of pressurizing the system shall be disconnected from the system before starting the 1 hour pressure holding period. If the pressure cannot be held for the specified length of time the cause of pressure loss shall be determined, corrected and the hydrostatic pressure cycling and first hydrostatic pressure test repeated until the system can hold the required pressure for at least 1 hour.

3.14.3 Operational Test

Operational tests shall be performed on the complete system or testable portions thereof. The test shall be conducted with full design flows and operating temperatures in all runs of piping as if in service, to demonstrate satisfactory function and operating effectiveness. The operational test will have two cycles. Each cycle shall consist of a 6-hour period with glycol in the system at the maximum operating temperature and maximum flow rate and a period of at least 6 hours with no flow rate. The Contractor shall supply temporary pumps, piping connections, boilers, and the gages required to circulate the glycol at the desired temperatures and flow rates. Glycol shall be circulated through supply lines and returned through the return piping to demonstrate that the pressure drop is compatible with the flow rate and size of pipe and to show that obstructions do not exist in the piping system. Any unusual indicated pressure drop will be investigated and any obstructions removed. Any leaks found shall be repaired. After any leaks have been removed and any leaks repaired, the carrier piping tests shall be repeated.

3.14.4 Final Hydrostatic Test Sub Title

: After successful completion of the operational test, the system shall be pressurized to 1-1/2 times the working pressure up to 1035 kPa. This pressure shall be held for a minimum of 4 hours. The method of pressurizing the system shall be disconnected from the system prior to the

start of the 4-hour pressure holding period. If the pressure cannot be held for the specified length of time, the cause of the pressure loss shall be determined, corrected, and all of the tests repeated.

3.15 Construction Quality Control

Attention is directed to SECTION:
control inspection, testing, and reporting.
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SECTION 15895

AIR SUPPLY, DISTRIBUTION, VENTILATION, AND EXHAUST SYSTEM

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AIR CONDITIONING AND REFRIGERATION INSTITUTE (ARI)

ARI 350	(1986) Sound Rating of Non-Ducted Indoor Air-Conditioning Equipment
ARI 410	(1991) Forced-Circulation Air-Cooling and Air-Heating Coils
ARI 430	(1989) Central-Station Air-Handling Units
ARI 440	(1989) Room Fan-Coil Air-Conditioners
ARI 445	(1987) Room Air-Induction Units
ARI 880	(1990) Air Terminals
ARI Guideline D	(1987) Application and Installation of Central Station Air-Handling Units

AIR CONDITIONING CONTRACTORS OF AMERICA (ACCA)

ACCA Manual 4	(1990) Installation Techniques for Perimeter Heating & Cooling
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AIR MOVEMENT AND CONTROL ASSOCIATION (AMCA)

AMCA 210	(1985) Laboratory Methods of Testing Fans for Rating
AMCA 300	(1994) Reverberant Room Method for Sound Testing of Fans

AMERICAN BEARING MANUFACTURERS ASSOCIATION (ABEMA)

ABEMA 9	(1990) Load Ratings and Fatigue Life for Ball Bearings
ABEMA 11	(1990) Load Ratings and Fatigue Life for Roller Bearings

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI S12.32	(1990) Precision Methods for the
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Determination of Sound Power Levels of
Discrete Frequency and Narrow-Band Noise
Sources in Reverberation Rooms

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 47	(1990) Ferritic Malleable Iron Castings
ASTM A 53	(1993a) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
ASTM A 106	(1994) Seamless Carbon Steel Pipe for High-Temperature Service
ASTM A 123	(1989a) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 167	(1993) Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
ASTM A 181	(1994) Forgings, Carbon Steel, for General-Purpose Piping
ASTM A 183	(1983; R 1990) Carbon Steel Track Bolts and Nuts
ASTM A 193	(1996) Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service
ASTM A 234	(1996) Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures
ASTM A 536	(1984; R 1993) Ductile Iron Castings
ASTM A 733	(1993) Welded and Seamless Carbon Steel and Austenitic Stainless Steel Pipe Nipples
ASTM A 924	(1994) General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
ASTM B 62	(1993) Composition Bronze or Ounce Metal Castings
ASTM B 75	(1993) Seamless Copper Tube
ASTM B 88	(1993a) Seamless Copper Water Tube
ASTM B 117	(1994) Operating Salt Spray (Fog) Testing Apparatus
ASTM B 650	(1993) Electrodeposited Engineering Chromium Coatings of Ferrous Substrates

ASTM C 916	(1985; Rev 1990) Adhesives for Duct Thermal Insulation
ASTM C 1071	(1991) Thermal and Acoustical Insulation (Glass Fiber, Duct Lining Material)
ASTM D 520	(1984; R 1989) Zinc Dust Pigment
ASTM D 1384	(1993) Corrosion Test for Engine Coolants in Glassware
ASTM D 1654	(1992) Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments
ASTM D 1785	(1993) Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
ASTM D 2000	(1990; R 1994) Rubber Products in Automotive Applications
ASTM D 2466	(1993) Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40
ASTM D 2564	(1993) Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems
ASTM D 2855	(1993) Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings
ASTM D 3359	(1995) Measuring Adhesion by Tape Test
ASTM E 84	(1994) Surface Burning Characteristics of Building Materials
ASTM E 437	(1992) Industrial Wire Cloth and Screens (Square Opening Series)
ASTM F 872	(1984; R 1990) Filter Units, Air-Conditioning: Viscous-Impingement Type, Cleanable
ASTM F 1199	(1988; R 1993) Cast (All Temperature and Pressures) and Welded Pipe Line Strainers (150 psig and 150 degrees F Maximum)
ASTM F 1200	(1988; R 1993) Fabricated (Welded) Pipe Line Strainers (Above 150 psig and 150 degrees F)
AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)	
ASHRAE 15	(1994) Safety Code for Mechanical Refrigeration

ASHRAE 52.1	(1992) Gravimetric and Dust-Spot Procedures for Testing Air-Cleaning Devices Used in General Ventilation for Removing Particulate Matter
ASHRAE 68	(1986) Laboratory Method of Testing In-Duct Sound Power Measurement Procedures for Fans
ASHRAE 70	(1991) Method of Testing Rating the Performance of Air Outlets and Inlets
ASHRAE 84	(1991) Method of Testing Air-to-Air Heat Exchangers

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B1.20.1	(1983; R 1992) Pipe Threads, General Purpose (Inch)
ASME B16.3	(1992) Malleable Iron Threaded Fittings
ASME B16.5	(1988; Errata Oct 88; B16.5a) Pipe Flanges and Flanged Fittings
ASME B16.9	(1993) Factory-Made Wrought Steel Buttwelding Fittings
ASME B16.11	(1991) Forged Fittings, Socket-Welding and Threaded
ASME B16.18	(1984; R 1994) Cast Copper Alloy Solder Joint Pressure Fittings
ASME B16.21	(1992) Nonmetallic Flat Gaskets for Pipe Flanges
ASME B16.22	(1989) Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
ASME B16.26	(1988) Cast Copper Alloy Fittings for Flared Copper Tubes
ASME B16.39	(1986; R 1994) Malleable Iron Threaded Pipe Unions Classes 150, 250, and 300
ASME B31.1	(1995) Power Piping
ASME B40.1	(1991) Gauges - Pressure Indicating Dial Type - Elastic Element
ASME BPV IX	(1995; Addenda Dec 1995) Boiler and Pressure Vessel Code; Section IX, Welding and Brazing Qualifications

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C606	(1987) Grooved and Shouldered Joints
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AMERICAN WELDING SOCIETY (AWS)

AWS D1.1 (1994) Structural Welding Code - Steel

COMMERCIAL ITEM DESCRIPTIONS (CID)

CID A-A-1419 (Rev D) Filter Element, Air Conditioning
(Viscous-Impingement and Dry Types,
Replaceable)

EXPANSION JOINT MANUFACTURERS ASSOCIATION (EJMA)

EJMA-01 (1993) EJMA Standards

INSTITUTE OF ENVIRONMENTAL SCIENCES (IES)

IES RP-CC-001.3 (1993) HEPA and ULPA Filters

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS
INDUSTRY (MSS)

MSS SP-25 (1993) Standard Marking System for Valves,
Fittings, Flanges and Unions

MSS SP-58 (1993) Pipe Hangers and Supports -
Materials, Design and Manufacture

MSS SP-69 (1991) Pipe Hangers and Supports -
Selection and Application

MSS SP-70 (1990) Cast Iron Gate Valves, Flanged and
Threaded Ends

MSS SP-71 (1990) Cast Iron Swing Check Valves,
Flanged and Threaded Ends

MSS SP-72 (1992) Ball Valves with Flanged or
Butt-Welding Ends for General Service

MSS SP-80 (1987) Bronze Gate, Globe, Angle and Check
Valves

MSS SP-85 (1994) Cast Iron Globe & Angle Valves,
Flanged and Threaded Ends

MSS SP-110 (1992) Ball Valves Threaded,
Socket-Welding, Solder Joint, Grooved and
Flared Ends

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA MG 1 (1993; Rev 1-1993; Rev 2-1995) Motors and
Generators

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (1993) National Electrical Code

NFPA 90A (1993) Installation of Air Conditioning

and Ventilating Systems

NFPA 96 (1994) Installation of Equipment for the Removal of Smoke and Grease-Laden Vapors from Commercial Cooking Equipment

NORTH AMERICAN INSULATION MANUFACTURERS ASSOCIATION (NAIMA)

NAIMA-AH116 (1993) Fibrous Glass Duct Construction Standards

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)

SMACNA-01 (1975) Accepted Industry Practice for Industrial Duct Construction

SMACNA-05 (1992) Fire, Smoke and Radiation Damper Installation Guide for HVAC Systems

SMACNA-06 (1985) HVAC Duct Construction Standards - Metal and Flexible

SMACNA-10 (1985) HVAC Air Duct Leakage Test Manual

UNDERWRITERS LABORATORIES (UL)

UL-01 (1995; Supple) Building Materials Directory

UL-03 (1995) Electrical Construction Materials Directory

UL-05 (1995; Supple) Fire Resistance Directory

UL 94 (1991; Rev thru Apr 1995) Tests for Flammability of Plastic Materials for Parts in Devices and Appliances

UL 181 (1994; Rev Sep 95) Factory-Made Air Ducts and Air Connectors

UL 214 (1993) Tests for Flame-Propagation of Fabrics and Films

UL 555 (1995) Fire Dampers

UL 586 (1990; Rev Apr 1995) High-Efficiency, Particulate, Air Filter Units

UL 705 (1994; Rev thru Apr 1995) Power Ventilators

UL 723 (1993; Rev Apr 1994) Test for Surface Burning Characteristics of Building Materials

UL 900 (1994) Test Performance of Air Filter Units

UL 1995 (1990) Heating and Cooling Equipment

1.2 COORDINATION OF TRADES Ductwork, piping offsets, fittings, and accessories shall be furnished as required to provide a complete installation and to eliminate interference with other construction.

1.3 DELIVERY AND STORAGE

Equipment delivered and placed in storage shall be stored with protection from the weather, humidity and temperature variations, dirt and dust, or other contaminants.

1.4 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL PROCEDURES:

SD-01 Data

Components and Equipment Data; FIO.

Manufacturer's catalog data shall be included with the detail drawings for the following items. The data shall be highlighted to show model, size, options, etc., that are intended for consideration. Data shall be adequate to demonstrate compliance with contract requirements for the following:

- a. Ductwork Components
- b. Air Systems Equipment
- c. Air Handling Units

SD-04 Drawings

Air Supply, Distribution, Ventilation, and Exhaust Equipment; FIO.

Drawings shall consist of equipment layout including assembly and installation details and electrical connection diagrams; ductwork layout showing the location of all supports and hangers, typical hanger details, gauge reinforcement, reinforcement spacing rigidity classification, and static pressure and seal classifications; and piping layout showing the location of all guides and anchors, the load imposed on each support or anchor, and typical support details. Drawings shall include any information required to demonstrate that the system has been coordinated and will properly function as a unit and shall show equipment relationship to other parts of the work, including clearances required for operation and maintenance.

SD-06 Instructions

Test Procedures; FIO.

Proposed test procedures for piping hydrostatic test, ductwork leak test, and performance tests of systems, at least 2 weeks prior to the start of related testing.

System Diagrams; FIO.

Proposed diagrams, at least 2 weeks prior to start of related testing.

System diagrams that show the layout of equipment, piping, and ductwork, and typed condensed operation manuals explaining preventative maintenance procedures, methods of checking the system for normal, safe operation, and procedures for safely starting and stopping the system shall be framed under glass or laminated plastic. After approval, these items shall be posted where directed.

SD-07 Schedules

Test Schedules; FIO.

Proposed test schedules for hydrostatic test of piping, ductwork leak test, and performance tests, at least 2 weeks prior to the start of related testing.

Field Training Schedule; FIO.

Proposed schedule for field training, at least 2 weeks prior to the start of related training.

SD-08 Statements

Similar Services; FIO.

Statement demonstrating successful completion of similar services on at least 5 projects of similar size and scope, at least 2 weeks prior to submittal of other items required by this section.

SD-09 Reports

Test Reports; FIO.

Test reports for the piping hydrostatic test, ductwork leak test, and performance tests in booklet form, upon completion of testing. Reports shall document phases of tests performed including initial test summary, repairs/adjustments made, and final test results.

SD-13 Certificates

Bolts; FIO.

Written certification from the bolt manufacturer that the bolts furnished comply with the requirements of this specification. The certification shall include illustrations of product markings, and the number of each type of bolt to be furnished.

SD-19 Operation and Maintenance Manuals

Air Supply, Distribution, Ventilation, and Exhaust Manuals; FIO.

Six manuals listing step-by-step procedures required for system startup, operation, shutdown, and routine maintenance, at least 2 weeks prior to field training. The manuals shall include the manufacturer's name, model number, parts list, list of parts and tools that should be kept in stock by the owner for routine maintenance including the name of a local supplier, simplified wiring and controls diagrams, troubleshooting guide, and recommended service organization (including address and telephone number) for each item of equipment. Each service organization submitted shall be capable of providing 4 hour onsite response to a service call on an

emergency basis.

PART 2 PRODUCTS

2.1 STANDARD PRODUCTS

Components and equipment shall be standard products of a manufacturer regularly engaged in the manufacturing of products that are of a similar material, design and workmanship. The standard products shall have been in satisfactory commercial or industrial use for 2 years before bid opening. The 2-year experience shall include applications of components and equipment under similar circumstances and of similar size. The 2 years must be satisfactorily completed by a product which has been sold or is offered for sale on the commercial market through advertisements, manufacturers' catalogs, or brochures. Products having less than a 2-year field service record will be acceptable if a certified record of satisfactory field operation, for not less than 6000 hours exclusive of the manufacturer's factory tests, can be shown. The equipment items shall be supported by a service organization.

2.2 ASBESTOS PROHIBITION

Asbestos and asbestos-containing products shall not be used.

2.3 NAMEPLATES

Equipment shall have a nameplate that identifies the manufacturer's name, address, type or style, model or serial number, and catalog number.

2.4 EQUIPMENT GUARDS AND ACCESS

Belts, pulleys, chains, gears, couplings, projecting setscrews, keys, and other rotating parts exposed to personnel contact shall be fully enclosed or guarded according to OSHA requirements. High temperature equipment and piping exposed to contact by personnel or where it creates a potential fire hazard shall be properly guarded or covered with insulation of a type specified.

2.5 PIPING COMPONENTS: See section heating and Utilites System, Central Steam 15562

2.6 ELECTRICAL WORK

Electrical motor-driven equipment specified shall be provided complete with motor, motor starter, and controls. Unless otherwise specified, electric equipment, including wiring and motor efficiencies, shall be according to Section 16415 ELECTRICAL WORK, INTERIOR. Electrical characteristics and enclosure type shall be as shown. Unless otherwise indicated, motors of 745 W and above shall be high efficiency type. Motor starters shall be provided complete with thermal overload protection and other appurtenances necessary. Each motor shall be according to NEMA MG 1 and shall be of sufficient size to drive the equipment at the specified capacity without exceeding the nameplate rating of the motor. Manual or automatic control and protective or signal devices required for the operation specified, and any control wiring required for controls and devices, but not shown, shall be provided. Where two-speed or variable-speed motors are indicated, solid-state variable-speed controller may be provided to accomplish the same function. Solid-state variable-speed controllers shall be utilized for motors rated 7.45 kW (10 hp) or less. Adjustable frequency drives

shall be used for larger motors.

2.7 CONTROLS

Controls shall be provided as specified in Section 15950 HEATING, VENTILATING AND AIR CONDITIONING (HVAC) CONTROL SYSTEMS.

2.8 DUCTWORK COMPONENTS

2.8.1 Metal Ductwork

All aspects of metal ductwork construction, including all fittings and components, shall comply with SMACNA-06 unless otherwise specified. Elbows shall be radius type with a centerline radius of 1-1/2 times the width or diameter of the duct where space permits. Otherwise, elbows having a minimum radius equal to the width or diameter of the duct or square elbows with factory fabricated turning vanes may be used. Static pressure Class 500 Pa (2 inch w.g.) ductwork shall meet the requirements of Seal Class C.

Class 750 through 2500 Pa (3 through 10 inch) shall meet the requirements of Seal Class A. Sealants shall conform to fire hazard classification specified in Section 15250 THERMAL INSULATION FOR MECHANICAL SYSTEMS. Pressure sensitive tape shall not be used as a sealant. Spiral lock seam duct, and flat oval shall be made with duct sealant and locked with not less than 3 equally spaced drive screws or other approved methods indicated in SMACNA-06. The sealant shall be applied to the exposed male part of the fitting collar so that the sealer will be on the inside of the joint and fully protected by the metal of the duct fitting. One brush coat of the sealant shall be applied over the outside of the joint to at least 50 mm band width covering all screw heads and joint gap. Dents in the male portion of the slip fitting collar will not be acceptable. Outdoor air intake ducts and plenums shall be fabricated with watertight soldered or brazed joints and seams.

2.8.1.1 Transitions

Diverging air flow transitions shall be made with each side pitched out a maximum of 15 degrees, for an included angle of 30 degrees. Transitions for converging air flow shall be made with each side pitched in a maximum of 30 degrees, for an included angle of 60 degrees, or shall be as indicated. Factory-fabricated reducing fittings for systems using round duct sections when formed to the shape of the ASME short flow nozzle, need not comply with the maximum angles specified.

2.8.1.2 General Service Duct Connectors

A flexible duct connector approximately 150 mm in width shall be provided where sheet metal connections are made to fans or where ducts of dissimilar metals are connected. For round/oval ducts, the flexible material shall be secured by stainless steel or zinc-coated, iron clinch-type draw bands. For rectangular ducts, the flexible material locked to metal collars shall be installed using normal duct construction methods. The composite connector system shall comply with UL 214 and be classified as "flame-retarded fabrics" in UL-01.

2.8.2 Ductwork Accessories

2.8.2.1 Duct Access Doors

Access doors shall be provided in ductwork and plenums where indicated and

at all air flow measuring primaries, automatic dampers, fire dampers, coils, thermostats, and other apparatus requiring service and inspection in the duct system, and unless otherwise shown, shall conform to SMACNA-06. Access doors shall be provided upstream and downstream of air flow measuring primaries and heating and cooling coils. Doors shall be minimum 375 by 450 mm, unless otherwise shown. Where duct size will not accommodate this size door, the doors shall be made as large as practicable. Doors 600 by 600 mm or larger shall be provided with fasteners operable from both sides. Doors in insulated ducts shall be the insulated type.

2.8.2.2 Fire Dampers

Fire dampers shall be 1-1/2 hour fire rated unless otherwise indicated. Fire dampers shall conform to the requirements of NFPA 90A and UL 555. Fire dampers shall be automatic operating type and shall have a dynamic rating suitable for the maximum air velocity and pressure differential to which it will be subjected. Fire dampers shall be approved for the specific application, and shall be installed according to their listing. Fire dampers shall be equipped with a steel sleeve or adequately sized frame installed in such a manner that disruption of the attached ductwork, if any, will not impair the operation of the damper. Sleeves or frames shall be equipped with perimeter mounting angles attached on both sides of the wall or floor opening. Ductwork in fire-rated floor-ceiling or roof-ceiling assembly systems with air ducts that pierce the ceiling of the assemblies shall be constructed in conformance with UL-05. Fire dampers shall be curtain type with damper blades out of the air stream or single blade type or multi-blade type. Dampers shall not reduce the duct or the air transfer opening cross-sectional area. Dampers shall be installed so that the centerline of the damper depth or thickness is located in the centerline of the wall, partition or floor slab depth or thickness. Unless otherwise indicated, the installation details given in SMACNA-05 and in manufacturer's instructions for fire dampers shall be followed.

2.8.2.3 Manual Balancing Dampers

Manual balancing dampers shall be furnished with accessible operating mechanisms. Where operators occur in finished portions of the building, operators shall be chromium plated with all exposed edges rounded. Dampers shall be 2 gauges heavier than the duct in which installed. Unless otherwise indicated, multileaf dampers shall be opposed blade type with maximum blade width of 300 mm. Access doors or panels shall be provided for all concealed damper operators and locking setscrews. Unless otherwise indicated, the locking-type quadrant operators for dampers, when installed on ducts to be thermally insulated, shall be provided with stand-off mounting brackets, bases, or adapters to provide clearance between the duct surface and the operator not less than the thickness of the insulation. Stand-off mounting items shall be integral with the operator or standard accessory of the damper manufacturer. Volume dampers shall be provided where indicated.

2.8.2.4 Air Deflectors and Branch Connections

Air deflectors shall be provided at duct mounted supply outlets, at takeoff or extension collars to supply outlets, at duct branch takeoff connections, and at 90 degree elbows, as well as at locations as indicated on the drawings or otherwise specified. Conical branch connections or 45 degree entry connections may be used in lieu of deflectors or extractors for branch connections. All air deflectors, except those installed in 90

degree elbows, shall be provided with an approved means of adjustment. Adjustment shall be made from easily accessible means inside the duct or from an adjustment with sturdy lock on the face of the duct. When installed on ducts to be thermally insulated, external adjustments shall be provided with stand-off mounting brackets, integral with the adjustment device, to provide clearance between the duct surface and the adjustment device not less than the thickness of the thermal insulation. Air deflectors shall be factory-fabricated units consisting of curved turning vanes or louver blades designed to provide uniform air distribution and change of direction with minimum turbulence or pressure loss. Air deflectors shall be factory or field assembled. Blade air deflectors, also called blade air extractors, shall be approved factory fabricated units consisting of equalizing grid and adjustable blade and lock. Adjustment shall be easily made from the face of the diffuser or by position adjustment and lock external to the duct. Stand-off brackets shall be provided on insulated ducts and are described herein. Fixed air deflectors, also called turning vanes, shall be provided in 90 degree elbows.

2.8.3 Duct Sleeves, Framed Prepared Openings, Closure Collars

2.8.3.1 Duct Sleeves

Duct sleeves shall be provided for round ducts 375 mm in diameter or less passing through floors, walls, ceilings, or roof, and installed during construction of the floor, wall, ceiling, or roof. Round ducts larger than 375 mm in diameter and square, rectangular, and oval ducts passing through floors, walls, ceilings, or roof shall be installed through framed prepared openings. The Contractor shall be responsible for the proper size and location of sleeves and prepared openings. Sleeves and framed openings are also required where grilles, registers, and diffusers are installed at the openings. Framed prepared openings shall be fabricated from 1.0 mm (20 gauge) galvanized steel, unless otherwise indicated. Where sleeves are installed in bearing walls or partitions, black steel pipe, ASTM A 53, Schedule 20 shall be used. Sleeve shall provide 25 mm clearance between the duct and the sleeve or 25 mm clearance between the insulation and the sleeve for insulated ducts.

2.8.3.2 Framed Prepared Openings

Openings shall have 25 mm clearance between the duct and the opening or 25 mm clearance between the insulation and the opening for insulated ducts.

2.8.3.3 Closure Collars

Collars shall be fabricated of galvanized sheet metal not less than 100 mm wide, unless otherwise indicated, and shall be installed on exposed ducts on each side of walls or floors where sleeves or prepared openings are provided. Collars shall be installed tight against surfaces. Collars shall fit snugly around the duct or insulation. Sharp edges of the collar around insulated duct shall be ground smooth to preclude tearing or puncturing the insulation covering or vapor barrier. Collars for round ducts 375 mm in diameter or less shall be fabricated from 1.0 mm (20 gauge) galvanized steel. Collars for round ducts larger than 375 mm and square, and rectangular ducts shall be fabricated from 1.3 mm (18 gauge) galvanized steel. Collars shall be installed with fasteners on maximum 150 mm centers, except that not less than 4 fasteners shall be used.

2.8.4 Registers, and Grilles

Units shall be factory-fabricated of aluminum and shall distribute the specified quantity of air evenly over space intended without causing noticeable drafts, air movement faster than 0.25 m/s (50 fpm) in occupied zone, or dead spots anywhere in the conditioned area. Outlets for diffusion, spread, throw, and noise level shall be as required for specified performance. Performance shall be certified according to ASHRAE 70. Inlets and outlets shall be sound rated and certified according to ASHRAE 70. Registers shall be provided with volume damper with accessible operator, unless otherwise indicated; or if standard with the manufacturer, an automatically controlled device will be acceptable. Volume dampers shall be opposed blade type for all registers. Where the inlet and outlet openings are located less than 2 m above the floor, they shall be protected by a grille or screen according to NFPA 90A.

2.8.4.1 Supply and Return Grilles

Return and exhaust registers may be fixed horizontal or vertical louver type similar in appearance to the supply register face. Return grilles shall be provided with sponge-rubber gasket between flanges and wall or ceiling. Return and exhaust registers shall be located 150 mm above the floor unless otherwise indicated.

2.8.5 Gravity Air Vents

Air vents shall be fabricated from galvanized steel or aluminum sheets with galvanized or aluminum structural shapes. Sheet metal thickness, reinforcement, and fabrication shall conform to SMACNA-06. Louver blades shall be accurately fitted and secured to frames. Edges of louver blades shall be folded or beaded for rigidity and baffled to exclude driving rain. Air vents, penthouses, and goosenecks shall be provided with bird screen.

2.8.6 Bird Screens and Frames

Bird screens shall conform to ASTM E 437, Type I, Class 1, 2 by 2 mesh, 1.6 mm diameter aluminum wire or 0.8 mm inch diameter stainless steel wire. Frames shall be removable type or stainless steel or extruded aluminum.

2.9 AIR SYSTEMS EQUIPMENT

2.9.1 Coils

Coils shall be fin-and-tube type constructed of seamless copper tubes and aluminum or copper fins mechanically bonded or soldered to the tubes. Copper tube wall thickness shall be a minimum of 0.6096 mm. Aluminum fins shall be 0.14mm minimum thickness. Copper fins shall be 0.114 mm (0.0045 inch) minimum thickness.] Casing and tube support sheets shall be not lighter than 1.6 mm (16 gauge) galvanized steel, formed to provide structural strength. When required, multiple tube supports shall be provided to prevent tube sag. Each coil shall be tested at the factory under water at not less than 2.76 MPa (400 psi) air pressure and shall be suitable for 1.38 MPa (200 psi) working pressure. Coils shall be mounted for counterflow service. Coils shall be rated and certified according to ARI 410.

2.9.1.1 Steam Heating Coils

Steam coils shall be constructed of cast semisteel, welded steel or copper headers, and copper tubes. Headers shall be constructed of cast iron,

welded steel or copper. Fin tube and header section shall float within the casing to allow free expansion of tubing for coils subject to high pressure steam service. Each coil shall be provided with a field or factory installed vacuum breaker. Coils shall be single-tube type with tubes not less than 12 mm (1/2 inch) outside diameter, except for steam preheat coils. Supply headers shall distribute steam evenly to all tubes at the indicated steam pressure. Coils shall be factory tested to ensure that, when supplied with a uniform face velocity, temperature across the leaving side will be uniform with a maximum variation of no more than 5 percent.

2.9.2 Air Filters

Air filters shall be listed according to requirements of UL 900, except high efficiency particulate air filters of 99.97 percent efficiency by the DOP Test method shall be as listed under the Label Service and shall meet the requirements of UL 586.

2.9.2.1 Holding Frames

Frames shall be fabricated from not lighter than 1.6 mm (16 gauge) sheet steel with rust-inhibitor coating. Each holding frame shall be equipped with suitable filter holding devices. Holding frame seats shall be gasketed. All joints shall be airtight.

2.10 AIR HANDLING UNITS

2.10.1 Factory-Fabricated Air Handling Units

Units shall be single-zone draw-through types as indicated. Units shall include fans, coils, airtight insulated casing, filter sections, adjustable V-belt drives, belt guards for externally mounted motors, access sections where indicated, vibration-isolators, and appurtenances required for specified operation. Vibration isolators shall be combination rubber-inshear/spring type for units designated for low pressure duty. Each air handling unit shall have physical dimensions suitable to fit space allotted to the unit and shall have the capacity indicated. Air handling unit shall have published ratings based on tests performed according to ARI 430.

2.10.1.1 Casings

Casing sections shall be constructed of a minimum 18 gauge galvanized steel, or 18 gauge steel outer casing protected with a corrosion resistant paint finish according to paragraph FACTORY PAINTING. Casing shall be designed and constructed with an integral structural steel frame such that exterior panels are non-load bearing. Exterior panels shall be individually removable. Removal shall not affect the structural integrity of the unit. Casings shall be provided with inspection doors, access sections, and access doors. Inspection and access doors shall be insulated, fully gasketed, double-wall type, of a minimum 1.3 mm (18 gauge) outer and 1.0 mm (20 gauge) inner panels. Doors shall be rigid and provided with heavy duty hinges and latches. Inspection doors shall be a minimum 300 mm wide by 300 mm high. Access doors shall be minimum 600 mm wide and shall be the full height of the unit casing or a minimum of 1800 mm, whichever is less. Access Sections shall be according to paragraph AIR HANDLING UNITS. Drain pan shall be double-bottom type constructed of 16 gauge galvanized steel, pitched to the drain connection. Drain pans shall be constructed water tight, treated to prevent corrosion, and designed for positive condensate drainage. Duct liner material, coating,

and adhesive shall conform to fire-hazard requirements specified in Section 15250 THERMAL INSULATION FOR MECHANICAL SYSTEMS. Exposed insulation edges and joints where insulation panels are butted together shall be protected with a metal nosing strip or shall be coated to conform to meet erosion resistance requirements of ASTM C 1071. A latched and hinged inspection door, shall be provided in the fan and coil sections.

2.10.1.2 Heating Coils

Coils shall be provided as specified in paragraph AIR SYSTEMS EQUIPMENT, for types indicated.

2.10.1.3 Air Filters

Air filters shall be as specified in paragraph AIR SYSTEMS EQUIPMENT for types and thickness indicated.

2.10.1.4 Fans

Fans shall be double-inlet, centrifugal type with each fan in a separate scroll. Fans and shafts shall be dynamically balanced prior to installation into air handling unit, then the entire fan assembly shall be statically and dynamically balanced at the factory after it has been installed in the air handling unit. Fans shall be mounted on steel shafts accurately ground and finished. Fan bearings shall be sealed against dust and dirt and shall be precision self-aligning ball or roller type. Bearing life shall be L50 rated at not less than 200,000 hours as defined by ABEMA 9 and ABEMA 11. Bearings shall be permanently lubricated or lubricated type with lubrication fittings readily accessible at the drive side of the unit.

Bearings shall be supported by structural shapes, or die formed sheet structural members, or support plates securely attached to the unit casing.

Bearings may not be fastened directly to the unit sheet metal casing. Fans and scrolls shall be furnished with coating indicated. Fans shall be driven by a unit-mounted or a floor-mounted motor connected to fans by V-belt drive complete with belt guard for externally mounted motors. Belt guards shall be the three sided enclosed type with solid or expanded metal face. Belt drives shall be designed for not less than a 1.3 service factor based on motor nameplate rating. Motor sheaves shall be variable pitch for 20 kW and below and fixed pitch above 20 kW as defined by ARI Guideline D.

Where fixed sheaves are required, variable pitch sheaves may be used during air balance, but shall be replaced with an appropriate fixed sheave after air balance is completed. Variable pitch sheaves shall be selected to drive the fan at a speed that will produce the specified capacity when set at the approximate midpoint of the sheave adjustment. Motors for V-belt drives shall be provided with adjustable bases. Fan motors shall have open enclosures. Motor starters shall be reduced-voltage-start type with general-purpose enclosure. Unit fan or fans shall be selected to produce the required capacity at the fan static pressure. Sound power level shall be as indicated. The sound power level values shall be obtained according to AMCA 300 or ASHRAE 68.

2.10.1.5 Access Sections and Filter Boxes

Access sections shall be provided where indicated and shall be furnished with access doors as shown. Access sections and filter boxes shall be constructed in a manner identical to the remainder of the unit casing and shall be equipped with access doors. Mixing boxes shall be designed to minimize air stratification and to promote thorough mixing of the air streams.

2.10.1.6 Dampers

Dampers shall be as specified in paragraph CONTROLS.

2.12 FACTORY PAINTING

Units which are not of galvanized construction according to ASTM A 123 or ASTM A 924 shall be factory painted with a corrosion resisting paint finish. Internal and external ferrous metal surfaces shall be cleaned, phosphatised and coated with a paint finish which has been tested according to ASTM B 117, ASTM D 1654, and ASTM D 3359. Evidence of satisfactory paint performance for a minimum of 125 hours for units to be installed indoors and 500 hours for units to be installed outdoors shall be submitted. Rating of failure at the scribe mark shall be not less than 6, average creepage not greater than 3 mm. Rating of the inscribed area shall not be less than 10, no failure. On units constructed of galvanized steel which have been welded, exterior surfaces of welds or welds that have burned through from the interior shall receive a final shop docket of zinc-rich protective paint according to ASTM D 520 Type I.

PART 3 EXECUTION

3.1 INSTALLATION

Work shall be installed as shown and according to the manufacturer's diagrams and recommendations.

3.1.1 Equipment and Installation

Frames and supports shall be provided for air handling units, dampers, and other similar items requiring supports. Air handling units shall be floor mounted or ceiling hung, as indicated. The method of anchoring and fastening shall be as detailed. Floor-mounted equipment, unless otherwise indicated, shall be set on not less than 150 mm (6 inch) concrete pads or curbs doweled in place. Foundation drawings, bolt-setting information, and foundation bolts shall be furnished prior to concrete foundation construction for all equipment indicated or required to have concrete foundations. Concrete for foundations shall be as specified in Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE.

3.1.2 Flexible Connectors

Pre-insulated flexible connectors and flexible duct shall be attached to other components in accordance with the latest printed instructions of the manufacturer to ensure a vapor tight joint. Hangers, when required to suspend the connectors, shall be of the type recommended by the connector or duct manufacturer and shall be provided at the intervals recommended.

3.1.3 Sleeved and Framed Openings

Space between the sleeved or framed opening and the duct or the duct insulation shall be packed as specified in Section 07270 FIRESTOPPING for fire rated penetrations. For non-fire rated penetrations, the space shall be packed as specified in Section 07920 JOINT SEALING.

3.1.4 Metal Ductwork

Installation shall be according to SMACNA-06 unless otherwise indicated.

Duct supports for sheet metal ductwork shall be according to SMACNA-06, unless otherwise specified. Friction beam clamps indicated in SMACNA-06 shall not be used. Risers on high velocity ducts shall be anchored in the center of the vertical run to allow ends of riser to move due to thermal expansion. Supports on the risers shall allow free vertical movement of the duct. Supports shall be attached only to structural framing members and concrete slabs. Supports shall not be anchored to metal decking unless a means is provided and approved for preventing the anchor from puncturing the metal decking. Where supports are required between structural framing members, suitable intermediate metal framing shall be provided. Where C-clamps are used, retainer clips shall be provided.

3.1.4.1 Dust Control

To prevent the accumulation of dust, debris and foreign material during construction, temporary dust control protection shall be provided. The distribution system (supply and return) shall be protected with temporary seal-offs at all inlets and outlets at the end of each day's work. Temporary protection shall remain in place until system is ready for startup.

3.1.4.2 Insulation

Thickness and application of insulation materials for ductwork, piping, and equipment shall be according to Section 15250 THERMAL INSULATION FOR MECHANICAL SYSTEMS.

3.1.4.3 Duct Test Holes

Holes with closures or threaded holes with plugs shall be provided in ducts and plenums as indicated or where necessary for the use of pitot tube in balancing the air system. Extensions, complete with cap or plug, shall be provided where the ducts are insulated.

3.1.5 FIELD PAINTING AND PIPING IDENTIFICATION

Finish painting of items only primed at the factory or surfaces not specifically noted otherwise and identification for piping are specified in Section 09900 PAINTING, GENERAL.

3.1.6 DUCTWORK LEAK TEST

Ductwork leak test shall be performed for the entire air distribution and exhaust system, including fans, coils, filters, etc. Test procedure, apparatus, and report shall conform to SMACNA-10. Ductwork leak test shall be completed with satisfactory results prior to applying insulation to ductwork exterior.

3.1.7 CLEANING AND ADJUSTING

Inside of ducts, plenums, and casing shall be thoroughly cleaned of debris and blown free of small particles of rubbish and dust and then shall be vacuum cleaned before installing outlet faces. Equipment shall be wiped clean, with traces of oil, dust, dirt, or paint spots removed. Temporary filters shall be provided prior to startup of all fans that are operated during construction, and new filters shall be installed after all construction dirt has been removed from the building, and the ducts, plenums, casings, and other items specified have been vacuum cleaned. System shall be maintained in this clean condition until final acceptance.

Bearings shall be properly lubricated with oil or grease as recommended by the manufacturer. Belts shall be tightened to proper tension. Control valves and other miscellaneous equipment requiring adjustment shall be adjusted to setting indicated or directed. Fans shall be adjusted to the speed indicated by the manufacturer to meet specified conditions.

3.1.8 TESTING, ADJUSTING, AND BALANCING

Testing, adjusting, and balancing shall be as specified in Section 15990 TESTING, ADJUSTING AND BALANCING OF HVAC SYSTEMS. Testing, adjusting, and balancing shall begin only when the air supply and distribution, including controls, has been completed, with the exception of performance tests.

3.1.9 PERFORMANCE TESTS

After testing, adjusting, and balancing has been completed as specified, each system shall be tested as a whole to see that all items perform as integral parts of the system and temperatures and conditions are evenly controlled throughout the building. Corrections and adjustments shall be made as necessary to produce the conditions indicated or specified. Capacity tests and general operating tests shall be conducted by an experienced engineer. Tests shall cover a period of not less than 2 days for each system and shall demonstrate that the entire system is functioning according to the specifications. Coincidental chart recordings shall be made at points indicated on the drawings for the duration of the time period and shall record the temperature at space thermostats or space sensors, the humidity at space humidistats or space sensors and the ambient temperature and humidity in a shaded and weather protected area.

3.1.10 FIELD TRAINING

The Contractor shall conduct a training course for operating and maintenance personnel as designated by the Contracting Officer. Training shall be provided for a period of 8 hours of normal working time and shall start after the system is functionally complete but prior to the performance tests. The field instruction shall cover all of the items contained in the approved Operating and Maintenance Instructions.

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SECTION 15990

TESTING, ADJUSTING AND BALANCING OF HVAC SYSTEMS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

- | | |
|------------|----------------------------------------------------------------------------------|
| ANSI S1.4 | (1983; S1.4A) Sound Level Meters |
| ANSI S1.11 | (1986; R 1993) Octave-Band and Fractional-Octave-Band Analog and Digital Filters |

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR CONDITIONING ENGINEERS (ASHRAE)

- | | |
|------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| ASHRAE 111 | (1988) Practices for Measurement, Testing, Adjusting, and Balancing of Building Heating, Ventilation, Air-Conditioning and Refrigeration Systems |
|------------|--------------------------------------------------------------------------------------------------------------------------------------------------|

ASSOCIATED AIR BALANCE COUNCIL (AABC)

- | | |
|-----------|--------------------------------------------------------------------------------------------------------|
| AABC MN-1 | (1989) National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems |
|-----------|--------------------------------------------------------------------------------------------------------|

COOLING TOWER INSTITUTE (CTI)

- | | |
|-------------|------------------------------------------------------|
| CTI ATC-105 | (1990) Acceptance Test Code for Water-Cooling Towers |
|-------------|------------------------------------------------------|

NATIONAL ENVIRONMENTAL BALANCING BUREAU (NEBB)

- | | |
|---------|--------------------------------------------------------------------------------------|
| NEBB-01 | (1991) Procedural Standards for Testing Adjusting Balancing of Environmental Systems |
|---------|--------------------------------------------------------------------------------------|

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

- | | |
|----------|-----------------------------------------------------------------|
| NFPA 90A | (1993) Installation of Air Conditioning and Ventilating Systems |
|----------|-----------------------------------------------------------------|

SHEET METAL & AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)

- | | |
|-----------|--------------------------------------------------------|
| SMACNA-07 | (1993) HVAC Systems - Testing, Adjusting and Balancing |
|-----------|--------------------------------------------------------|

1.2 GENERAL REQUIREMENTS

The Contractor shall select AABC MN-1, NEBB-01, SMACNA-07 or ASHRAE 111 as the standard for providing testing, adjusting and balancing of air and water systems. The selected standard shall be used throughout the project.

Testing, adjusting, and balancing shall be accomplished by a firm certified for testing and balancing by Associated Air Balance Council (AABC) or National Environmental Balancing Bureau (NEBB). Prior to testing, adjusting, and balancing, the Contractor shall verify that the systems have been installed and are operating as specified. Approved detail drawings and all other data required for each system and/or component to be tested shall be made available at the jobsite during the entire testing, adjusting and balancing effort. The Contractor shall verify that all balancing devices are properly installed to permit testing, adjusting and balancing and that all duct leakage tests have been completed prior to testing, adjusting and balancing. The Contracting Officer shall be notified in writing of all equipment, components, or balancing devices, that are damaged, incorrectly installed, or missing, as well as any design deficiencies that will prevent proper testing, adjusting, and balancing. Testing, adjusting, and balancing shall not commence until approved by the Contracting Officer. Instrumentation accuracy shall be in accordance with the standard selected in this paragraph.

1.3 INSTRUMENT ACCURACY REQUIREMENTS

All instrumentation shall be checked for accuracy before beginning testing, adjusting and balancing procedures. Instrument accuracy shall be in accordance with the standard selected in paragraph GENERAL REQUIREMENTS. Checks may be carried out against similar equipment maintained specifically for checking purposes or by the manufacturer or a recognized testing facility. All instrumentation used for testing shall be calibrated within 6 months of use. Pitot tubes and U-tube manometers do not require checking. In no case shall the instrumentation accuracy be less than specified by the instrument manufacturer. Any instrument falling out of calibration during the process of balancing and testing shall be recalibrated or removed from the site and replaced by a properly calibrated instrument. No instruments shall be allowed to remain on-site that are not in calibration.

1.4 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL PROCEDURES:

SD-09 Reports

Testing and Balancing; FIO.

Three copies of a preliminary report, 30days before balancing commences. The report shall be organized by specific systems and shall clearly identify each item of equipment to be tested, adjusted, and balanced. The appropriate test procedures and measurements to be taken for each item of equipment shall be listed. Instrument calibration records shall be provided on forms shown in AABC MN-1 or SMACNA-07. Manufacturer's specified accuracy shall be shown. The report shall include floor plans showing all measurement locations and types of measurements to be made. All related data necessary for testing, balancing, and adjusting, including

fan curves and pump curves, shall be included. A system readiness checklist, similar to that shown in SMACNA-07, shall be included. The report shall contain a listing of the deficiencies of all systems to be tested, adjusted and balanced and the corrective action taken. The report shall contain a schedule for the testing and balancing. Six copies of the final report on forms shown in AABC MN-1 or SMACNA-07, 30 days after completion of the test and balance operation. Data shall be in a hard bound cover identifying the project name, location, date of submittal, name of Contractor, and a general title indicating the specific area and type of work, and shall be signed by a registered professional engineer, employed by the test and balance firm, who has a minimum of 2 years experience in testing, adjusting and balancing work. The final report shall include a summary describing test methods, test results, and major corrective actions taken. The report shall include as-tested floor plans showing all measurement locations and types of measurements made. The air handling unit data shall include a static pressure profile diagram, and pitot tube traverses where possible. The VAV terminal data shall include maximum and minimum air flows, for design and actual conditions, and shall be supported with summaries which show the air outlet totals for each VAV terminal and the VAV terminal totals for each air handling unit. Air distribution data shall include coded drawings which show the exact location of each air outlet. Pump data shall include pump efficiency. Data for chillers, heating and cooling coils, and heat exchangers, shall include heat balance calculations. All instruments that are recalibrated and brought back onto the jobsite after being found to be out of calibration shall have recalibration records submitted on forms shown in AABC MN-1 or SMACNA-07.

SD-13 Certificates

Qualification; FIO.

Qualification data, 90 days prior to testing and balancing operations. The test and balance firm shall be certified by the Associated Air Balance Council (AABC) or the National Environmental Balancing Bureau (NEBB). The lead balancing technician shall be qualified by AABC or NEBB and his qualification data shall include past experience on at least five similar projects.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 TESTING AND BALANCING

3.1.1 General

The facility shall be essentially complete with final ceiling, walls, windows, doors and partitions in place. Doors and windows surrounding each area to be balanced shall be closed during testing and balancing operations. Air systems shall be complete and operable with balancing dampers, ducting, diffusers, returns, flow control boxes and control components in place. systems shall be complete and operable with balancing valves, flow meters, coils, pumps, piping and control components in place. All measurements and adjustments shall be made using procedures described in standard selected in paragraph GENERAL REQUIREMENTS. Air motion and distribution from air terminals shall be as shown. Smoke tests may be used to demonstrate proper air distribution from air terminals. All data including deficiencies encountered and corrective action taken shall

be recorded. If a system cannot be adjusted to meet the design requirements, the Contractor shall promptly notify the Contracting Officer in writing.

3.1.2 Air Systems

Clean filters shall be installed at the beginning of the testing, adjusting, and balancing effort. Each system shall be adjusted until all flow quantities are within plus ten percent and minus zero percent. Dampers shall be checked for tight shutoff. Air leakage around dampers shall be verified. Fire and smoke dampers shall be open. Fans shall be checked for correct direction of rotation and proper speed shall be verified. Fire and smoke dampers shall be tested at system design air flow to ensure proper closure in accordance with NFPA 90A and manufacturer's instructions prior to building occupancy.

3.1.2.1 General Balancing Methods

In addition to the requirements for specific systems, flows in supply, exhaust and return air systems shall be balanced using the methods in standard selected in paragraph GENERAL REQUIREMENTS. Throttling losses shall be limited. Air flow adjustments shall be made by first adjusting the fan speed to meet the design flow conditions. Fan speed adjustment may not be required for fan motors which are less than 746 W, or if throttling results in no greater than an additional 1/3 W draw above that required if the fan speed were adjusted. Flows and pressures shall be checked in all main risers and supply ducts at all supply, exhaust and return fan discharges. All flows shall be recorded before and after each adjustment.

3.1.2.2 Specific Systems

All special or additional procedures for testing and balancing shall be in accordance with the applicable requirements of the standard selected in paragraph GENERAL REQUIREMENTS. If a system has diversity, only the required quantity of wide open terminals shall be used to meet the design air flow.

3.1.3 Snow Melting System

All valves and control components shall be open or set as required for maximum system flow. Each system shall be adjusted until all flow quantities are within the tolerances of the standard selected in paragraph GENERAL REQUIREMENTS. Pumps shall be checked for proper speed. Pump motor current shall be checked at maximum design flow.

3.1.3.1 General Balancing Methods

In addition to the requirements for specific systems, flows in piping, components shall be balanced using the flow meter, equipment pressure drop or pump curve methods in accordance with the applicable provisions of the standard selected in paragraph GENERAL REQUIREMENTS. Flows shall be checked in all main risers and branches and condenser water lines and at all heating heat exchangers, and pump discharges. Pressure taps on the pump shall be made at factory suction and discharge tappings where available. All flows shall be recorded before and after each adjustment.

3.1.3.2 Specific Systems

Where specific systems require special or additional procedures for testing

and balancing, such procedures shall be in accordance with the standard selected in paragraph GENERAL REQUIREMENTS. If a system has diversity, only the required quantity of wide-open terminals shall be used to meet the design water flow.

- a. Primary-Secondary: Primary-secondary systems shall be treated as separate systems. Primary systems shall be balanced first with the secondary systems running. Secondary systems shall then be balanced.

3.1.4 Marking of Setting

Following final acceptance of certified reports by the Contracting Officer, the setting of all HVAC adjustment devices including valves, splitters, and dampers shall be permanently marked by the testing and balancing engineer so that adjustment can be restored if disturbed at any time.

3.1.5 Marking of Test Ports

The testing and balancing engineer shall permanently and legibly mark and identify the location points of the duct test ports. If the ductwork has exterior insulation, these markings shall be made on the exterior side of the ductwork insulation. All penetrations through ductwork and ductwork insulation shall be properly sealed to prevent air leakage or loss of vapor barrier.

3.2 CONTROL SYSTEMS

Testing, adjusting, and balancing of the systems shall be coordinated with the control system installation. All control components shall be verified to be properly installed and operating as specified before proceeding with testing, adjusting, and balancing. Verification shall be in accordance with AABC MN-1.

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- 1.3 INSTRUMENT ACCURACY REQUIREMENTS
- 1.4 SUBMITTALS

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 - 3.1.2 Air Systems
 - 3.1.2.1 General Balancing Methods
 - 3.1.2.2 Specific Systems
 - 3.1.3 Snow Melting System
 - 3.1.3.1 General Balancing Methods
 - 3.1.3.2 Specific Systems
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 - 3.1.5 Marking of Test Ports
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SECTION 15990

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SD-13 Certificates

Qualification; FIO.

Qualification data, 90 days prior to testing and balancing operations. The test and balance firm shall be certified by the Associated Air Balance Council (AABC) or the National Environmental Balancing Bureau (NEBB). The lead balancing technician shall be qualified by AABC or NEBB and his qualification data shall include past experience on at least five similar projects.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 TESTING AND BALANCING

3.1.1 General

The facility shall be essentially complete with final ceiling, walls, windows, doors and partitions in place. Doors and windows surrounding each area to be balanced shall be closed during testing and balancing operations. Air systems shall be complete and operable with balancing dampers, ducting, diffusers, returns, flow control boxes and control components in place. systems shall be complete and operable with balancing valves, flow meters, coils, pumps, piping and control components in place. All measurements and adjustments shall be made using procedures described in standard selected in paragraph GENERAL REQUIREMENTS. Air motion and distribution from air terminals shall be as shown. Smoke tests may be used to demonstrate proper air distribution from air terminals. All data including deficiencies encountered and corrective action taken shall

be recorded. If a system cannot be adjusted to meet the design requirements, the Contractor shall promptly notify the Contracting Officer in writing.

3.1.2 Air Systems

Clean filters shall be installed at the beginning of the testing, adjusting, and balancing effort. Each system shall be adjusted until all flow quantities are within plus ten percent and minus zero percent. Dampers shall be checked for tight shutoff. Air leakage around dampers shall be verified. Fire and smoke dampers shall be open. Fans shall be checked for correct direction of rotation and proper speed shall be verified. Fire and smoke dampers shall be tested at system design air flow to ensure proper closure in accordance with NFPA 90A and manufacturer's instructions prior to building occupancy.

3.1.2.1 General Balancing Methods

In addition to the requirements for specific systems, flows in supply, exhaust and return air systems shall be balanced using the methods in standard selected in paragraph GENERAL REQUIREMENTS. Throttling losses shall be limited. Air flow adjustments shall be made by first adjusting the fan speed to meet the design flow conditions. Fan speed adjustment may not be required for fan motors which are less than 746 W, or if throttling results in no greater than an additional 1/3 W draw above that required if the fan speed were adjusted. Flows and pressures shall be checked in all main risers and supply ducts at all supply, exhaust and return fan discharges. All flows shall be recorded before and after each adjustment.

3.1.2.2 Specific Systems

All special or additional procedures for testing and balancing shall be in accordance with the applicable requirements of the standard selected in paragraph GENERAL REQUIREMENTS. If a system has diversity, only the required quantity of wide open terminals shall be used to meet the design air flow.

3.1.3 Snow Melting System

All valves and control components shall be open or set as required for maximum system flow. Each system shall be adjusted until all flow quantities are within the tolerances of the standard selected in paragraph GENERAL REQUIREMENTS. Pumps shall be checked for proper speed. Pump motor current shall be checked at maximum design flow.

3.1.3.1 General Balancing Methods

In addition to the requirements for specific systems, flows in piping, components shall be balanced using the flow meter, equipment pressure drop or pump curve methods in accordance with the applicable provisions of the standard selected in paragraph GENERAL REQUIREMENTS. Flows shall be checked in all main risers and branches and condenser water lines and at all heating heat exchangers, and pump discharges. Pressure taps on the pump shall be made at factory suction and discharge tappings where available. All flows shall be recorded before and after each adjustment.

3.1.3.2 Specific Systems

Where specific systems require special or additional procedures for testing

and balancing, such procedures shall be in accordance with the standard selected in paragraph GENERAL REQUIREMENTS. If a system has diversity, only the required quantity of wide-open terminals shall be used to meet the design water flow.

- a. Primary-Secondary: Primary-secondary systems shall be treated as separate systems. Primary systems shall be balanced first with the secondary systems running. Secondary systems shall then be balanced.

3.1.4 Marking of Setting

Following final acceptance of certified reports by the Contracting Officer, the setting of all HVAC adjustment devices including valves, splitters, and dampers shall be permanently marked by the testing and balancing engineer so that adjustment can be restored if disturbed at any time.

3.1.5 Marking of Test Ports

The testing and balancing engineer shall permanently and legibly mark and identify the location points of the duct test ports. If the ductwork has exterior insulation, these markings shall be made on the exterior side of the ductwork insulation. All penetrations through ductwork and ductwork insulation shall be properly sealed to prevent air leakage or loss of vapor barrier.

3.2 CONTROL SYSTEMS

Testing, adjusting, and balancing of the systems shall be coordinated with the control system installation. All control components shall be verified to be properly installed and operating as specified before proceeding with testing, adjusting, and balancing. Verification shall be in accordance with AABC MN-1.

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SECTION 16375

ELECTRICAL DISTRIBUTION SYSTEM, UNDERGROUND

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI C2	(1997) National Electrical Safety Code
ANSI C12.1	(1988) Code for Electricity Metering
ANSI C12.4	(1984; R 1990) Mechanical Demand Registers
ANSI C12.10	(1987) Electromechanical Watthour Meters
ANSI C12.11	(1987) Instrument Transformers for Revenue Metering, 10 kV BIL through 350 kV (0.6 kV NSV through 69 kV NSV)
ANSI C29.1	(1988) Electrical Power Insulators - Test Methods
ANSI C37.50	(1989) Low-Voltage AC Power Circuit Breakers Used in Enclosures - Test Procedures
ANSI C37.121	(1989) Unit Substations Requirement
ANSI C57.12.13	(1982) Conformance Requirements for Liquid-Filled Transformers Used in Unit Installations, Including Unit Substations
ANSI C57.12.21	(1980) Requirements for Pad-Mounted Compartmental-Type, Self-Cooled, Single-Phase Distribution Transformers with High-Voltage Bushings; High-Voltage, 34 500 GrdY/19 920 Volts and Below; Low-Voltage, 240/120 Volts; 167 kVA and Smaller
ANSI C57.12.26	(1993) Pad-Mounted Compartmental-Type, Self-Cooled, Three-Phase Distribution Transformers for use with Separable Insulated High-Voltage Connectors, High-Voltage, 34 500 GrdY/19 920 Volts and Below; 2500 kVa and Smaller
ANSI C57.12.27	(1982) Conformance Requirements for Liquid-Filled Distribution Transformers Used in Pad-Mounted Installations, Including Unit Substations

ANSI C80.1	(1990) Rigid Steel Conduit - Zinc Coated
ANSI C119.1	(1986) Sealed Insulated Underground Connector Systems Rated 600 Volts
ANSI C135.30	(1988) Zinc-Coated Ferrous Ground Rods for Overhead or Underground Line Construction
ANSI O5.1	(1992) Specifications and Dimensions for Wood Poles

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 48	(1994a) Gray Iron Castings
ASTM A 123	(1989a) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 153	(1982; R 1987) Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM B 8	(1993) Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
ASTM B 117	(1994) Operating Salt Spray (Fog) Testing Apparatus
ASTM C 478	(1994) Precast Reinforced Concrete Manhole Sections
ASTM D 923	(1991) Sampling Electrical Insulating Liquids
ASTM D 1654	(1992) Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments
ASTM D 4059	(1991) Analysis of Polychlorinated Biphenyls in Insulating Liquids by Gas Chromatography
ASTM F 883	(1990) Padlocks

ASSOCIATION OF EDISON ILLUMINATING COMPANIES (AEIC)

AEIC CS5	(1994) Specifications for Cross-linked Polyethylene Insulated Shielded Power Cables Rated 5 Through 46 kV
AEIC CS6	(1987; Rev Mar 1989) Ethylene Propylene Rubber Insulated Shielded Power Cables Rated 5 Through 69 kV

COMMERCIAL ITEM DESCRIPTION (CID)

CID A-A-1927	(1993; Rev D) Padlock
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FACTORY MUTUAL ENGINEERING AND RESEARCH (FM)

FM P7825

(1995; Supple I) Approval Guide

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C37.20.1	(1993) Metal-Enclosed Low-Voltage Power Circuit-Breaker Switchgear
IEEE C37.20.2	(1993; C37.20.2b) Metal-Clad and Station-Type Cubicle Switchgear
IEEE C37.20.3	(1987) Metal-Enclosed Interrupter Switchgear
IEEE C37.23	(1987; R 1991) Guide for Metal-Enclosed Bus and Calculating Losses in Isolated-Phase Bus
IEEE C37.30	(1992) Definitions and Requirements for High-Voltage Air Switches, Insulators, and Bus Supports
IEEE C37.34	(1994) Test Code for High-Voltage Air Switches
IEEE C37.41	(1994) Design Tests for High-Voltage Fuses, Distribution Enclosed Single-Pole Air Switches, Fuse Disconnecting Switches, and Accessories
IEEE C37.63	(1984; R 1990) Requirements for Overhead, Pad-Mounted, Dry-Vault, and Submersible Automatic Line Sectionalizer for AC Systems
IEEE C37.90.1	(1989; R 1991) IEEE Standard Surge Withstand Capability (SWC) Tests for Protective Relays and Relay Systems
IEEE C37.98	(1987; R 1991) Seismic Testing of Relays
IEEE C57.12.00	(1993) IEEE Standard General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers
IEEE C57.13	(1993) Instrument Transformers
IEEE C57.98	(1993) Guide for Transformer Impulse Tests
IEEE C62.1	(1989; R 1994) Surge Arresters for ac Power Circuits
IEEE C62.2	(1987; R 1994) Guide for the Application of Gapped Silicon-Carbide Surge Arresters for Alternating Current Systems
IEEE C62.11	(1993) IEEE Standard Metal-Oxide Surge Arresters for AC Power Circuits
IEEE Std 48	(1990) Standard Test Procedures and Requirements for High-Voltage

Alternating-Current Cable Terminations

IEEE Std 81	(1983) Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System (Part1)
IEEE Std 100	(1992) IEEE Standard Dictionary of Electrical and Electronics Terms
IEEE Std 386	(1995) Separable Insulated Connector Systems for Power Distribution Systems Above 600 V
IEEE Std 404	(1993) Cable Joints for Use with Extruded Dielectric Cable Rated 5000 V through 46 000 V and Cable Joints for Use with Laminated Dielectric Cable Rated 2500 V Through 500 000 V
IEEE Std 590	(1977; R 1991) IEEE Cable Plowing Guide
IEEE Std 592	(1990) Exposed Semiconducting Shields on Premolded High Voltage Cable Joints and Separable Insulated Connectors

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA AB 1	(1993) Molded Case Circuit Breakers and Molded Case Switches
NEMA BU 1	(1994) Busways
NEMA FB 1	(1993) Fittings, Cast Metal Boxes and Conduit Bodies for Conduit and Cable Assemblies
NEMA FU 1	(1986) Low Voltage Cartridge Fuses
NEMA LA 1	(1992) Surge Arresters
NEMA PB 1	(1990) Panelboards
NEMA PB 2	(1989) Deadfront Distribution Switchboards
NEMA SG 2	(1993) High Voltage Fuses
NEMA SG 3	(1990) Low-Voltage Power Circuit Breakers
NEMA SG 5	(1990) Power Switchgear Assemblies
NEMA TC 5	(1990) Corrugated Polyolefin Coilable Plastic Utilities Duct
NEMA TC 6	(1990) PVC and ABS Plastic Utilities Duct for Underground Installation
NEMA TC 7	(1990) Smooth-Wall Coilable Polyethylene Electrical Plastic Duct

- NEMA WC 7 (1993)
Cross-Linked-Thermosetting-Polyethylene-
Insulated Wire and Cable for the
Transmission and Distribution of
Electrical Energy
- NEMA WC 8 (1993) Ethylene-Propylene-Rubber-Insulated
Wire and Cable for the Transmission and
Distribution of Electrical Energy

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

- NFPA 70 (1996) National Electrical Code

UNDERWRITERS LABORATORIES (UL)

- UL 6 (1993) Rigid Metal Conduit
- UL 198E (1988; Rev Jul 1988) Class R Fuses
- UL 467 (1993) Grounding and Bonding Equipment
- UL 486A (1991; Rev Oct 1991) Wire Connectors and
Soldering Lugs for Use with Copper
Conductors
- UL 486B (1991; Rev thru Apr 1992) Wire Connectors
for Use with Aluminum Conductors
- UL 489 (1991; Rev Jun 1995) Molded-Case Circuit
Breakers and Circuit-Breaker Enclosures
- UL 510 (1994) Insulating Tape
- UL 514A (1991; Rev Apr 1995) Metallic Outlet Boxes
- UL 651 (1989; Rev thru Dec 1989) Schedule 40 and
80 Rigid PVC Conduit
- UL 854 (1991; Rev thru Nov 1994) Service-Entrance
Cables
- UL 857 (1994) Busways and Associated Fittings
- UL 1242 (1983; Rev thru Jul 1993) Intermediate
Metal Conduit
- UL 1684 (1993) Reinforced Thermosetting Resin
Conduit

1.2 GENERAL REQUIREMENTS

1.2.1 Terminology

Terminology used in this specification is as defined in IEEE Std 100.

1.2.2 Service Conditions

Items provided under this section shall be specifically suitable for the following service conditions:

- a. Altitude 1403 to 1463 m
- b. Ambient Temperature -10 to 40 degrees C
- c. Seismic Zone 3

1.3 SUBMITTALS

Governmental approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL PROCEDURES:

SD-01 Data

Manufacturer's Catalog Data; FIO.

Catalog cuts, brochures, circulars, specifications, product data, and printed information in sufficient detail and scope to verify compliance with the requirements of the contract documents.

Material, Equipment, and Fixture Lists; FIO.

A complete itemized listing of equipment and materials proposed for incorporation into the work. Each entry shall include an item number, the quantity of items proposed, and the name of the manufacturer of each such item.

Installation Procedures; FIO.

As a minimum, installation procedures for transformers, medium-voltage cable terminations and splices.

Procedures shall include diagrams, instructions, and precautions required to install, adjust, calibrate, and test the devices and equipment.

SD-04 Drawings

Electrical Distribution System; FIO.

Detail drawings consisting of equipment drawings, illustrations, schedules, instructions, diagrams manufacturers standard installation drawings and other information necessary to define the installation and enable the Government to check conformity with the requirements of the contract drawings.

If departures from the contract drawings are deemed necessary by the Contractor, complete details of such departures shall be included with the detail drawings. Approved departures shall be made at no additional cost to the Government.

Detail drawings shall show how components are assembled, function together and how they will be installed on the project. Data and drawings for component parts of an item or system shall be coordinated and submitted as a unit. Data and drawings shall be coordinated and included in a single submission. Multiple submissions for the same equipment or system are not

acceptable except where prior approval has been obtained from the Contracting Officer. In such cases, a list of data to be submitted later shall be included with the first submission. Detail drawings shall consist of the following:

- a. Detail drawings showing physical arrangement, construction details, connections, finishes, materials used in fabrication, provisions for conduit or access requirements for installation and maintenance, physical size, electrical characteristics, foundation and support details, and equipment weight. Drawings shall be drawn to scale and/or dimensioned. All optional items shall be clearly identified as included or excluded.
- b. Internal wiring diagrams of equipment showing wiring as actually provided for this project. External wiring connections shall be clearly identified.

Detail drawings shall as a minimum depict the installation of the following items:

- a. Transformers.

As-Built Drawings; FIO.

The as-built drawings shall be a record of the construction as installed. The drawings shall include the information shown on the contract drawings as well as deviations, modifications, and changes from the contract drawings, however minor. The as-built drawings shall be a full sized set of prints marked to reflect deviations, modifications, and changes. The as-built drawings shall be complete and show the location, size, dimensions, part identification, and other information. Additional sheets may be added. The as-built drawings shall be jointly inspected for accuracy and completeness by the Contractor's quality control representative and by the Contracting Officer prior to the submission of each monthly pay estimate. Upon completion of the work, the Contractor shall provide three full sized sets of the marked prints to the Contracting Officer for approval. If upon review, the as-built drawings are found to contain errors and/or omissions, they will be returned to the Contractor for correction. The Contractor shall correct and return the as-built drawings to the Contracting Officer for approval within 10 calendar days from the time the drawings are returned to the Contractor.

SD-09 Reports

Factory Test; FIO.

Certified factory test reports shall be submitted when the manufacturer performs routine factory tests, including tests required by standards listed in paragraph REFERENCES. Results of factory tests performed shall be certified by the manufacturer, or an approved testing laboratory, and submitted within 7 days following successful completion of the tests. The manufacturer's pass-fail criteria for tests specified in paragraph FIELD TESTING shall be included.

Field Testing; FIO.

A proposed field test plan, 30 days prior to testing the installed system. No field test shall be performed until the test plan is approved. The test plan shall consist of complete field test procedures including tests to be

performed, test equipment required, and tolerance limits.

Test Reports; FIO.

Six copies of the information described below in 215.9 by 279.4 mm (8-1/2 by 11 inch) binders having a minimum of three rings, including a separate section for each test. Sections shall be separated by heavy plastic dividers with tabs.

- a. A list of equipment used, with calibration certifications.
- b. A copy of measurements taken.
- c. The dates of testing.
- d. The equipment and values to be verified.
- e. The condition specified for the test.
- f. The test results, signed and dated.
- g. A description of adjustments made.

SD-13 Certificates

Materials and Equipment; FIO.

Where materials or equipment are specified to conform to the standards of the Underwriters Laboratories (UL) or to be constructed or tested, or both, in accordance with the standards of the American National Standards Institute (ANSI), the Institute of Electrical and Electronics Engineers (IEEE), or the National Electrical Manufacturers Association (NEMA), the Contractor shall submit proof that the items provided conform to such requirements. The label of, or listing by, UL will be acceptable as evidence that the items conform. Either a certification or a published catalog specification data statement, to the effect that the item is in accordance with the referenced ANSI or IEEE standard, will be acceptable as evidence that the item conforms. A similar certification or published catalog specification data statement to the effect that the item is in accordance with the referenced NEMA standard, by a company listed as a member company of NEMA, will be acceptable as evidence that the item conforms. In lieu of such certification or published data, the Contractor may submit a certificate from a recognized testing agency equipped and competent to perform such services, stating that the items have been tested and that they conform to the requirements listed, including methods of testing of the specified agencies. Compliance with above-named requirements does not relieve the Contractor from compliance with any other requirements of the specifications.

Cable Splicer Qualification; FIO.

A certification that contains the names and the qualifications of people recommended to perform the splicing and termination of medium-voltage cables approved for installation under this contract. The certification shall indicate that any person recommended to perform actual splicing and terminations has been adequately trained in the proper techniques and have had at least three recent years of experience in splicing and terminating the same or similar types of cables approved for installation. In addition, any person recommended by the Contractor may be required to

perform a practice splice and termination, in the presence of the Contracting Officer, before being approved as a qualified installer of medium-voltage cables. If that additional requirement is imposed, the Contractor shall provide short sections of the approved types of cables along with the approved type of splice and termination kits, and detailed manufacturer's instruction for the proper splicing and termination of the approved cable types.

Cable Installer Qualifications; FIO.

The Contractor shall provide at least one onsite person in a supervisory position with a documentable level of competency and experience to supervise all cable pulling operations. A resume shall be provided showing the cable installers' experience in the last three years, including a list of references complete with points of contact, addresses and telephone numbers.

SD-19 Operation and Maintenance Manuals

Electrical Distribution System; FIO.

Six copies of Operation and Maintenance manuals, within 7 calendar days following the completion of tests and including assembly, installation, operation and maintenance instructions, spare parts data which provides supplier name, current cost, catalog order number, and a recommended list of spare parts to be stocked. Manuals shall also include data outlining detailed procedures for system startup and operation, and a troubleshooting guide which lists possible operational problems and corrective action to be taken. A brief description of all equipment, basic operating features, and routine maintenance requirements shall also be included. Documents shall be bound in a binder marked or identified on the spine and front cover. A table of contents page shall be included and marked with pertinent contract information and contents of the manual. Tabs shall be provided to separate different types of documents, such as catalog ordering information, drawings, instructions, and spare parts data. Index sheets shall be provided for each section of the manual when warranted by the quantity of documents included under separate tabs or dividers.

Three additional copies of the instructions manual, within 30 calendar days following the approval of the manuals.

1.4 DELIVERY, STORAGE, AND HANDLING

Devices and equipment shall be visually inspected by the Contractor when received and prior to acceptance from conveyance. Stored items shall be protected from the environment in accordance with the manufacturer's published instructions. Damaged items shall be replaced. Oil filled transformers and switches shall be stored in accordance with the manufacturer's requirements. Metal poles shall be handled and stored in accordance with the manufacturer's instructions.

1.5 EXTRA MATERIALS

One additional spare fuse or fuse element for each furnished fuse or fuse element shall be delivered to the contracting officer when the electrical system is accepted. Two complete sets of all special tools required for maintenance shall be provided, complete with a suitable tool box. Special tools are those that only the manufacturer provides, for special purposes (to access compartments, or operate, adjust, or maintain special parts).

PART 2 PRODUCTS

2.1 STANDARD PRODUCT

Material and equipment shall be the standard product of a manufacturer regularly engaged in the manufacture of the product and shall essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening. Items of the same classification shall be identical including equipment, assemblies, parts, and components.

2.2 NAMEPLATES

2.2.1 General

Each major component of this specification shall have the manufacturer's name, address, type or style, model or serial number, and catalog number on a nameplate securely attached to the equipment. Nameplates shall be made of noncorrosive metal. Equipment containing liquid dielectrics shall have the type of dielectric on the nameplate. As a minimum, nameplates shall be provided for transformers, circuit breakers, meters, switches, and panels.

2.2.2 Liquid-Filled Transformer Nameplates

Nameplates shall indicate percent impedance, voltage, kVA, frequency, number of phases, cooling class, insulation class, temperature rise, the number of liters and composition of liquid-dielectric, and shall be permanently marked with a statement that the dielectric supplied is non-polychlorinated biphenyl. If transformer nameplate is not so marked, the Contractor shall furnish manufacturer's certification for each transformer that the dielectric is non-PCB classified, with less than 50 ppm PCB content in accordance with paragraph LIQUID DIELECTRICS. Certifications shall be related to serial numbers on transformer nameplates. Transformer dielectric exceeding the 50 ppm PCB content or transformers without certification will be considered as PCB insulated and will not be accepted.

2.3 CORROSION PROTECTION

2.3.1 Aluminum Materials

Aluminum shall not be used.

2.3.2 Ferrous Metal Materials

2.3.2.1 Hardware

Ferrous metal hardware shall be hot-dip galvanized in accordance with ASTM A 153 and ASTM A 123.

2.3.2.2 Equipment

Equipment and component items, including but not limited to transformer stations and ferrous metal luminaries not hot-dip galvanized or porcelain enamel finished, shall be provided with corrosion-resistant finishes which shall withstand 120 hours of exposure to the salt spray test specified in ASTM B 117 without loss of paint or release of adhesion of the paint primer coat to the metal surface in excess of 1.6 mm (1/16 inch) from the test mark. The scribed test mark and test evaluation shall be in accordance

with ASTM D 1654 with a rating of not less than 7 in accordance with TABLE 1, (procedure A). Cut edges or otherwise damaged surfaces of hot-dip galvanized sheet steel or mill galvanized sheet steel shall be coated with a zinc rich paint conforming to the manufacturer's standard.

2.3.3 Finishing

Painting required for surfaces not otherwise specified and finish painting of items only primed at the factory shall be as specified in Section 09900 PAINTING, GENERAL.

2.4 CABLES

Cables shall be single conductor type unless otherwise indicated.

2.4.1 Conductor Material

Underground cables shall be of soft drawn copper, aluminum alloy AA-8000, or aluminum alloy 5005 conductor material.

2.4.2 Medium-Voltage Cables

2.4.2.1 General

Medium voltage cables shall conform to the requirements of NEMA WC 7 for cables utilizing cross-linked thermosetting polyethylene (XLP) insulation and NEMA WC 8 for cables utilizing ethylene-propylene-rubber (EPR) insulation. Cables shall be in accordance with the requirements of NFPA 70.

2.4.2.2 Insulation

Cables shall utilize cross-linked thermosetting polyethylene (XLP) insulation or ethylene-propylene-rubber (EPR) insulation. Cables shall be provided with 133 percent insulation level..

2.4.2.3 Jackets

Cables shall be provided with a nonmetallic jacket. Concentric neutral cables for direct buried applications shall have a moisture-resistant, nonmetallic jacket rated for direct burial.

2.4.2.4 Shielding

Cables rated for above 2 kV shall have both conductor and insulation shielding for each phase, except insulation shielding is not required for 5 kV armored or metallic-sheathed cable.

2.4.2.5 Ratings

Medium-voltage cables shall be rated for a circuit voltage of 15 kV.

2.4.3 Low-Voltage Cables

Cables shall be rated 600 volts and shall conform to the requirements of NFPA 70. Cables shall utilize cross-linked thermosetting polyethylene (XLP) insulation and shall conform to the requirements of NEMA WC 7 or [ethylene-propylene-rubber (EPR) insulation and shall conform to the requirements of NEMA WC 8.

2.4.3.1 In Duct

Cables shall be single-conductor cable, Type RHW, THW, THWN, USE, or XHHW in accordance with NFPA 70.

2.5 CABLE JOINTS, TERMINATIONS, AND CONNECTORS

2.5.1 Medium-Voltage Cable Joints

Medium-voltage cable joints shall comply with IEEE Std 404 and IEEE Std 592

Medium-voltage cable terminations shall comply with IEEE Std 48. Joints shall be the standard products of a manufacturer and shall be either of the factory preformed type or of the kit type containing tapes and other required parts. Joints shall have ratings not less than the ratings of the cables on which they are installed. Splice kits may be of the heat-shrinkable type for voltages up to 15 kV. Joints used in manholes shall be certified by the manufacturer for waterproof, submersible applications.

2.5.2 Medium-Voltage Separable Insulated Connectors

Separable insulated connectors shall comply with IEEE Std 386 and IEEE Std 592 and shall be of suitable construction or standard splice kits shall be used. Separable insulated connectors are acceptable for voltages up to 35 kV. Connectors shall be of the loadbreak type as indicated, of suitable construction for the application and the type of cable connected, and shall include cable shield adaptors. Separable insulated connectors shall not be used as substitutes for conventional permanent splices. External clamping points and test points shall be provided.

2.5.3 Low-Voltage Cable Splices

Low-voltage cable splices and terminations shall be rated at not less than 600 Volts. Splices in conductors No. 10 AWG and smaller shall be made with an insulated, solderless, pressure type connector, conforming to the applicable requirements of UL 486A. Splices in conductors No. 8 AWG and larger shall be made with noninsulated, solderless, pressure type connector, conforming to the applicable requirements of UL 486A and UL 486B. Splices shall then be covered with an insulation and jacket material equivalent to the conductor insulation and jacket. Splices below grade or in wet locations shall be sealed type conforming to ANSI C119.1 or shall be waterproofed by a sealant-filled, thick wall, heat shrinkable, thermosetting tubing or by pouring a thermosetting resin into a mold that surrounds the joined conductors.

2.5.4 Terminations

Terminations shall be in accordance with IEEE Std 48, Class 1 or Class 2; of the molded elastomer, wet-process porcelain, prestretched elastomer, heat-shrinkable elastomer, or taped type. Acceptable elastomers are track-resistant silicone rubber or track-resistant ethylene propylene compounds, such as ethylene propylene rubber or ethylene propylene diene monomer. Separable insulated connectors may be used for apparatus terminations, when such apparatus is provided with suitable bushings. Terminations shall be of the outdoor type, except that where installed inside outdoor equipment housings which are sealed against normal infiltration of moisture and outside air, indoor, Class 2 terminations are acceptable. Class 3 terminations are not acceptable. Terminations, where required, shall be provided with mounting brackets suitable for the

intended installation and with grounding provisions for the cable shielding, metallic sheath, and armor.

2.5.4.1 Factory Preformed Type

Molded elastomer, wet-process porcelain, prestretched, and heat-shrinkable terminations shall utilize factory preformed components to the maximum extent practicable rather than tape build-up. Terminations shall have basic impulse levels as required for the system voltage level. Leakage distances shall comply with wet withstand voltage test requirements of IEEE Std 48 for the next higher Basic Insulation Level (BIL) level. Anti-tracking tape shall be applied over exposed insulation of preformed molded elastomer terminations.

2.5.4.2 Taped Terminations

Taped terminations shall use standard termination kits providing terminal connectors, field-fabricated stress cones, and rain hoods. Terminations shall be at least 510 long from the end of the tapered cable jacket to the start of the terminal connector, or not less than the kit manufacturer's recommendations, whichever is greater.

2.6 CONDUIT AND DUCTS

Ducts shall be single, round-bore type, with wall thickness and fittings suitable for the application. Duct lines shall be concrete-encased, thin-wall type.

2.6.1 Metallic Conduit

Intermediate metal conduit shall comply with UL 1242. Rigid galvanized steel conduit shall comply with UL 6 and ANSI C80.1. Metallic conduit fittings and outlets shall comply with UL 514A and NEMA FB 1.

2.6.2 Nonmetallic Ducts

2.6.2.1 Concrete Encased Ducts

UL 651 Schedule 40 or NEMA TC 6 Type EB.

2.6.3 Conduit Sealing Compound

Compounds for sealing ducts and conduit shall have a putty-like consistency workable with the hands at temperatures as low as 2 degrees C (35 degrees F), shall neither slump at a temperature of 150 degrees C (300 degrees F), nor harden materially when exposed to the air. Compounds shall adhere to clean surfaces of fiber or plastic ducts; metallic conduits or conduit coatings; concrete, masonry; any cable sheaths, jackets, covers, or insulation materials; and the common metals. Compounds shall form a seal without dissolving, noticeably changing characteristics, or removing any of the ingredients. Compounds shall have no injurious effect upon the hands of workmen or upon materials.

2.7 TRANSFORMERS

Transformers shall be of the outdoor type having the ratings and arrangements indicated. Medium-voltage ratings of cable terminations shall be 15 kV between phases for 133 percent insulation level.

2.7.1 Pad-Mounted Transformers

Pad-mounted transformers shall comply with ANSI C57.12.26 and shall be of the radial type. Pad-mounted transformer shall be assembled and coordinated by one manufacturer and each transformer station shall be shipped as a complete unit so that field installation requirements are limited to mounting each unit on a concrete pad and connecting it to primary and secondary lines. Stainless steel pins and hinges shall be provided. Barriers shall be provided between high- and low-voltage compartments. High-voltage compartment doors shall be interlocked with low-voltage compartment doors to prevent access to any high-voltage section unless its associated low-voltage section door has first been opened. Compartments shall be sized to meet the specific dimensional requirements of ANSI C57.12.26. Pentahead locking bolts shall be provided with provisions for a padlock.

2.7.1.1 High-Voltage Compartments

High-voltage compartments shall be dead-front construction. Primary protection shall include loadbreak switching, drawout dry-well-mounted current-limiting fuses, and medium-voltage separable connectors, and surge arresters. Switches shall be of the group-operated type. Switches may be mounted inside transformer tanks with switch operating handles located in high-voltage compartments and equipped with metal loops for hook stick operation. Fuses shall be interlocked with switches so that fuses can be removed only when the associated switch is in the "OFF" position. Adjacent to medium-voltage cable connections, a nameplate or equivalent stencilled inscription shall be provided inscribed "DO NOT OPEN CABLE CONNECTORS UNLESS SWITCH IS OFF." Adjacent to switches, nameplates shall identify switch operating handles and "ON" and "OFF" positions. Surge arresters shall be fully insulated and configured to terminate on the same bushing as the primary cable by means of a loadbreak, feed-through bushing insert.

2.7.1.2 Transformer Tank Sections

Transformers shall comply with IEEE C57.12.00, ANSI C57.12.21, and ANSI C57.12.26 and shall be of the mineral oil-insulated type or less -flammable, liquid-insulated type with high molecular-weight hydrocarbon or dimethyl silicone liquid. Transformers shall be suitable for outdoor use and shall have 2 separate windings per phase. Standard NEMA primary taps shall be provided. Where primary taps are not specified, 4, 2-1/2 percent rated kVA high-voltage taps shall be provided 2 above and 2 below rated, primary voltage. Operating handles for primary tap changers for de-energized operation shall be located within high-voltage compartments, externally to transformer tanks. Adjacent to the tap changer operating handle, a nameplate or equivalent stenciled inscription shall be provided and inscribed "DO NOT OPERATE UNDER LOAD." Transformer ratings at 60 Hz shall be as follows:

Three-phase capacity.....	112.5 kVA
Impedance.....	2 percent
Temperature rise.....	65 degrees C
High-voltage winding.....	12000 volts
High-voltage winding connections.....	DELTA
Low-voltage winding.....	480/277 volts
Low-voltage winding connections.....	STAR

2.7.1.3 Low-Voltage Cable Compartments

Neutrals shall be provided with fully-insulated bushings. Clamp type cable terminations, suitable for copper conductors entering from below, shall be provided as necessary.

2.7.1.4 Accessories

High-voltage warning signs shall be permanently attached to each side of transformer stations. Voltage warning signs shall comply with ANSI C2. Copper-faced steel or stainless steel ground connection pads shall be provided in both the high- and low-voltage compartments. Insulated-bushing-type parking stands shall be provided adjacent to each separable load-break elbow to provide for cable isolation during sectionalizing operations.

2.8 METERING AND PROTECTIVE DEVICES

2.8.1 Circuit Breakers, Low-Voltage

Low-voltage circuit breakers shall comply with NEMA AB 1 and UL 489 for molded-case.

2.8.2 Fuses, Medium-Voltage, Including Current-Limiting

Medium-voltage fuses, including current-limiting, shall comply with NEMA SG 2.

2.8.3 Fuses, Low-Voltage, Current-Limiting

Low-voltage, current-limiting fuses shall comply with NEMA FU 1 for Class L or UL 198E for Class R.

2.9 SURGE ARRESTERS

Surge arresters shall comply with NEMA LA 1, IEEE C62.1, IEEE C62.2, and IEEE C62.11 and shall be provided where indicated. Arresters shall be distribution class, rated as shown. Arresters shall be equipped with mounting brackets suitable for the indicated installations. Arresters shall be of the valve or combination valve-metal-oxide varistor type.

2.10 GROUNDING AND BONDING

2.10.1 Driven Ground Rods

Ground rods shall be copper-clad steel conforming to UL 467 not less than 21 mm in diameter by 3.1 m (10 feet) in length. Sectional type rods may be used.

2.10.2 Grounding Conductors

Grounding conductors shall be bare, except where installed in conduit with associated phase conductors. Insulated conductors shall be of the same material as phase conductors and green color-coded, except that conductors shall be rated no more than 600 volts. Bare conductors shall be ASTM B 8 soft-drawn unless otherwise indicated. Aluminum is not acceptable.

2.11 CONCRETE AND REINFORCEMENT

Concrete shall be a minimum of 17.3 MPa (2500 psi) at 28 days. All other requirements shall be as specified in Section 03300 CONCRETE FOR BUILDING

CONSTRUCTION. Concrete reinforcing shall be as specified in Section 03200 CONCRETE REINFORCEMENT.

2.12 PADLOCKS

Padlocks shall conform to CID A-A 1927, with removable cores; in accordance with specification Section 08700.

2.13 CABLE FIREPROOFING SYSTEMS

Cable fireproofing systems shall be listed in FM P7825 as a fire-protective coating or tape approved for grouped electrical conductors and shall be suitable for application on the type of medium-voltage cables provided. After being fully cured, materials shall be suitable for use where exposed to oil, water, gases, salt water, sewage, and fungus and shall not damage cable jackets or insulation. Asbestos materials are not acceptable.

2.14 Fireproof Coating

Cable fireproofing coatings shall be compounded of water-based thermoplastic resins, flame-retardant chemicals, and inorganic noncombustible fibers and shall be suitable for the application methods used. Coatings applied on bundled cables shall have a derating factor of less than 5 percent, and a dielectric strength of 95 volts per mil minimum after curing.

2.15 Fireproofing Tape

Fireproofing tape shall be at least 50 mm (2 inches) wide and shall be a flexible, conformable, polymeric, elastomer tape designed specifically for fireproofing cables.

2.16 Plastic Tape

Preapplication plastic tape shall be pressure sensitive, 0.254 mm (10 mil) thick, conforming to UL 510.

2.17 LIQUID DIELECTRICS

Liquid dielectrics for transformers, and other liquid-filled electrical equipment shall be non-polychlorinated biphenyl (PCB) mineral-oil or less-flammable liquid as specified. Flammable fluids shall not be used. Tetrachloroethylene (perchloroethylene) and 1, 2, 4 trichlorobenzene fluids shall not be used. In lieu of the manufacturer's certification, the Contractor may submit a test sample of the dielectric in accordance with ASTM D 923 and have tests performed per ASTM D 4059 at a testing facility approved by the Contracting Officer. Equipment with test results indicating PCB level exceeding 50 ppm shall be replaced.

2.18 FACTORY TESTS

Factory tests shall be performed, as follows, in accordance with the applicable publications and with other requirements of these specifications. The Contracting Officer shall be notified at least 10 days before the equipment is ready for testing. The Contracting Officer reserves the right to witness the tests.

- a. Transformers: Manufacturer's standard routine, design and other tests in accordance with IEEE C57.12.00.

- b. Factory Preformed Terminations: Wet withstand voltage tests in accordance with IEEE Std 48 for the next higher BIL level.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

Equipment and devices shall be installed and energized in accordance with the manufacturer's published instructions. Steel conduits installed underground shall be protected from corrosion in conformance with the requirements of Section 16415 ELECTRICAL WORK, INTERIOR. Except as covered herein, excavation, trenching, and backfilling shall conform to the requirements of Section 02222 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS. Concrete work shall conform to the requirements of Section 03300A CONCRETE FOR BUILDING CONSTRUCTION.

3.1.1 Conformance to Codes

The installation shall comply with the requirements and recommendations of NFPA 70 and ANSI C2 as applicable.

3.1.2 Verification of Dimensions

The Contractor shall become familiar with details of the work, shall verify dimensions in the field, and shall advise the Contracting Officer of any discrepancy before performing any work.

3.1.3 Disposal of Liquid Dielectrics

PCB-contaminated dielectrics must be marked as PCB and transported to and incinerated by an approved EPA waste disposal facility. The Contractor shall furnish certification of proper disposal. Contaminated dielectrics shall not be diluted to lower the contamination level.

3.2 CABLE INSTALLATION

The Contractor shall obtain from the manufacturer an installation manual or set of instructions which addresses such aspects as cable construction, insulation type, cable diameter, bending radius, cable temperature, lubricants, coefficient of friction, conduit cleaning, storage procedures, moisture seals, testing for and purging moisture, etc.

3.2.1 Cable Installation Plan and Procedure

Cable shall be installed strictly in accordance with the cable manufacturer's recommendations. Each circuit shall be identified by means of a fiber, laminated plastic, or non-ferrous metal tags, or approved equal, in each manhole, and junction box. Each tag shall contain the following information; cable type, conductor size, circuit number, circuit voltage, cable destination and phase identification.

3.2.1.1 Cable Inspection

The cable reel shall be inspected for correct storage positions, signs of physical damage, and broken end seals. If end seal is broken, moisture shall be removed from cable in accordance with the cable manufacturer's recommendations.

3.2.1.2 Duct Cleaning

Duct shall be cleaned with an assembly that consists of a flexible mandrel (manufacturers standard product in lengths recommended for the specific size and type of duct) that is 6.4 mm less than inside diameter of duct, 2 wire brushes, and a rag. The cleaning assembly shall be pulled through conduit a minimum of 2 times or until less than a volume of 131 cubic centimeters (8 cubic inches) of debris is expelled from the duct.

3.2.1.3 Duct Lubrication

The cable lubricant shall be compatible with the cable jacket for cable that is being installed. Application of lubricant shall be in accordance with lubricant manufacturer's recommendations.

3.2.1.4 Cable Installation

The Contractor shall provide a cable feeding truck and a cable pulling winch as required. The Contractor shall provide a pulling grip or pulling eye in accordance with cable manufacturer's recommendations. The pulling grip or pulling eye apparatus shall be attached to polypropylene or manilla rope followed by lubricant front end packs and then by power cables. A dynamometer shall be used to monitor pulling tension. Pulling tension shall not exceed cable manufacturer's recommendations. The Contractor shall not allow cables to cross over while cables are being fed into duct. For cable installation in cold weather, cables shall be kept at 10 degrees C (50 degrees F) temperature for at least 24 hours before installation.

3.2.2 Duct Line

Medium-voltage cables and Low-voltage cables Cables shall be installed in duct lines where indicated. Cable joints in medium-voltage cables shall be made in manholes or approved pullboxes only. Neutral and grounding conductors shall be installed in the same duct with their associated phase conductors.

3.2.3 Insect and Rodent Damage

Cable and conductor entry openings in the transformer pads shall be stuffed to deter animal or rodent entry.

3.2.4 Electric Manholes

Cables shall be routed around the interior walls and securely supported from walls on cables racks. Cable routing shall minimize cable crossover, provide access space for maintenance and installation of additional cables, and maintain cable separation in accordance with ANSI C2.

3.3 CABLE JOINTS

Medium-voltage cable joints shall be made by qualified cable splicers only. Qualifications of cable splicers shall be submitted in accordance with paragraph SUBMITTALS. Shields shall be applied as required to continue the shielding system through each entire cable joint. Shields may be integrally molded parts of preformed joints. Shields shall be grounded at each joint or in accordance with manufacturer's recommended practice. Cable joints shall provide insulation and jacket equivalent to that of the

associated cable.

3.4 FIREPROOFING

Each medium-voltage cable and conductor in manholes shall be fire-proofed for their entire length within the manhole. Where cables and conductors have been lubricated to enhance pulling into ducts, the lubricant shall be removed from cables and conductors exposed in the manhole before fireproofing. Fire-stops shall be installed in each conduit entering or leaving a manhole.

3.4.1 Tape Method

Before application of fireproofing tape, plastic tape wrapping shall be applied over exposed metallic items such as the cable ground wire, metallic outer covering, or armor to minimize the possibility of corrosion from the fireproofing materials and moisture. Before applying fireproofing tape, irregularities of cables, such as at cable joints, shall be evened out with insulation putty. A flexible conformable polymeric elastomer fireproof tape shall be wrapped tightly around each cable spirally in 1/2 lapped wrapping or in 2 butt-jointed wrappings with the second wrapping covering the joints of the first.

3.4.2 Sprayable Method

Manholes shall be power ventilated until coatings are dry and dewatered and the coatings are cured. Ventilation requirements shall be in accordance with the manufacturer's instruction, but not less than 10 air changes per hour shall be provided. Cable coatings shall be applied by spray, brush, or glove to a wet film thickness that reduces to the dry film thickness approved for fireproofing by FM P7825. Application methods and necessary safety precautions shall be in accordance with the manufacturers instructions. After application, cable coatings shall be dry to the touch in 1 to 2 hours and fully cured in 48 hours, except where the manufacturer has stated that because of unusual humidity or temperature, longer periods may be necessary.

3.5 DUCT LINES

3.5.1 Requirements

Numbers and sizes of ducts shall be as indicated. Duct lines shall be laid with a minimum slope of 100 mm per 30 m. Depending on the contour of the finished grade, the high-point may be at a manhole, a handhole, or between manholes or handholes. Short-radius manufactured 90-degree duct bends may be used only for pole or equipment risers, unless specifically indicated as acceptable. The minimum manufactured bend radius shall be 450 mm (18 inches) for ducts of less than 80 mm (3 inch) diameter, and 900 mm (36 inches) for ducts 80 mm (3 inches) or greater in diameter. Otherwise, long sweep bends having a minimum radius of 7.6 m shall be used for a change of direction of more than 5 degrees, either horizontally or vertically. Both curved and straight sections may be used to form long sweep bends, but the maximum curve used shall be 30 degrees and manufactured bends shall be used. Ducts shall be provided with end bells whenever duct lines terminate in manholes or handholes.

3.5.2 Treatment

Ducts shall be kept clean of concrete, dirt, or foreign substances during

construction. Field cuts requiring tapers shall be made with proper tools and match factory tapers. A coupling recommended by the duct manufacturer shall be used whenever an existing duct is connected to a duct of different material or shape. Ducts shall be stored to avoid warping and deterioration with ends sufficiently plugged to prevent entry of any water or solid substances. Ducts shall be thoroughly cleaned before being laid. Plastic ducts shall be stored on a flat surface and protected from the direct rays of the sun.

3.5.3 Concrete Encasement

Ducts requiring concrete encasements shall comply with NFPA 70, except that electrical duct bank configurations for ducts 150 mm (6 inches) in diameter shall be determined by calculation and as shown on the drawings. The separation between adjacent electric power and communication ducts shall conform to ANSI C2. Duct line encasements shall be monolithic construction. Where a connection is made to a previously poured encasement, the new encasement shall be well bonded or doweled to the existing encasement. The Contractor shall submit proposed bonding method for approval in accordance with the detail drawing portion of paragraph SUBMITTALS. At any point, except railroad and airfield crossings, tops of concrete encasements shall be not less than the cover requirements listed in NFPA 70.

3.5.4 Installation of Couplings

Joints in each type of duct shall be made up in accordance with the manufacturer's recommendations for the particular type of duct and coupling selected and as approved.

3.5.4.1 Plastic Duct

Duct joints shall be made by brushing a plastic solvent cement on insides of plastic coupling fittings and on outsides of duct ends. Each duct and fitting shall then be slipped together with a quick 1/4-turn twist to set the joint tightly.

3.5.5 Duct Line Markers

Duct line markers, a 0.127 mm (5 mil) brightly colored plastic tape, not less than 75 mm (3 inches) in width and suitably inscribed at not more than 3 m (10 feet) on centers with a continuous metallic backing and a corrosion-resistant 0.0254 mm (1 mil) metallic foil core to permit easy location of the duct line, shall be placed approximately 300 mm below finished grade levels of such lines.

3.6 PAD-MOUNTED EQUIPMENT INSTALLATION

Pad-mounted equipment, shall be installed on concrete pads in accordance with the manufacturer's published, standard installation drawings and procedures, except that they shall be modified to meet the requirements of this document. Units shall be installed so that they do not damage equipment or scratch painted or coated surfaces. After installation, surfaces shall be inspected and scratches touched up with a paint or coating provided by the manufacturer especially for this purpose. Three-phase transformers shall be installed with synchronized phase sequence. Primary taps shall be set at mid-position.

3.6.1 Concrete Pads

3.6.1.1 Construction

Concrete pads for pad-mounted electrical equipment may be either pre-fabricated or shall be poured-in-place. Pads shall be constructed as indicated, except that exact pad dimensions and mounting details are equipment specific and are the responsibility of the Contractor. Tops of concrete pads shall be level and shall project 100 mm above finished grade and sloped to drain. Edges of concrete pads shall have 20 mm chamfer. Conduits for primary, secondary, and grounding conductors shall be set in place prior to placement of concrete pads. Where grounding electrode conductors are installed through concrete pads, PVC conduit sleeves shall be installed through the concrete to provide physical protection. To facilitate cable installation and termination, the concrete pad shall be provided with a rectangular hole below the primary and secondary compartments, sized in accordance with the manufacturer's recommended dimensions. Upon completion of equipment installation the rectangular hole shall be filled with masonry grout.

3.6.1.2 Concrete and Reinforcement

Concrete work shall comply with the requirements of Section 03300 CONCRETE FOR BUILDING CONSTRUCTION. Concrete pad reinforcement shall be in accordance with Section 03200 CONCRETE REINFORCEMENT.

3.6.1.3 Sealing

When the installation is complete, the Contractor shall seal all conduit and other entries into the equipment enclosure with an approved sealing compound. Seals shall be of sufficient strength and durability to protect all energized live parts of the equipment from rodents, insects, or other foreign matter.

3.7 CONNECTIONS TO BUILDINGS

Cables shall be extended into the various buildings as indicated, and shall be connected to the first applicable termination point in each building. Interfacing with building interior conduit systems shall be at conduit stubouts terminating 1.5 m outside of a building and 600 mm below finished grade as specified and provided under Section 16415 ELECTRICAL WORK, INTERIOR. After installation of cables, conduits shall be sealed with caulking compound to prevent entrance of moisture or gases into buildings.

3.8 GROUNDING

A ground ring consisting of the indicated configuration of bare copper conductors and driven ground rods shall be installed around pad-mounted equipment as shown. Equipment frames of metal-enclosed equipment, and other noncurrent-carrying metal parts, such as cable shields, cable sheaths and armor, and metallic conduit shall be grounded. At least 2 connections shall be provided from a transformer to the ground ringmat. Metallic frames and covers of handholes and pull boxes shall be grounded by use of a braided, copper ground strap with equivalent ampacity of No. 6 AWG.

3.8.1 Grounding Electrodes

Grounding electrodes shall be installed as shown on the drawings and as

follows:

- a. Driven rod electrodes - Unless otherwise indicated, ground rods shall be driven into the earth until the tops of the rods are approximately 300 mm below finished grade.
- b. Ground mat - A ground mat shall be installed as shown consisting of bare copper conductors installed 600 mm, plus or minus 75 mm, below the finished top of soil grade. Mat conductors shall be bonded to all rod electrodes, electrolytic electrodes, and to all other intersecting mat conductors. Mat conductors shall be sized as shown on the drawings.
- c. Ground ring - A ground ring shall be installed as shown consisting of bare copper conductors installed 600 mm, plus or minus 75 mm, below finished top of soil grade. Ground ring conductors shall be sized as shown with No. 2 AWG as minimum.
- d. Additional electrodes - When the required ground resistance is not met, additional electrodes shall be provided interconnected with grounding conductors to achieve the specified ground resistance. The additional electrodes will be up to three, 3 m rods spaced a minimum of 3 m apart. In high ground resistance, UL listed chemically charged ground rods may be used. If the resultant resistance exceeds 25 ohms measured not less than 48 hours after rainfall, the Contracting Officer shall be notified immediately.

3.8.2 Grounding and Bonding Connections

Connections above grade shall be made by the fusion-welding process or with bolted solderless connectors, in compliance with UL 467, and those below grade shall be made by a fusion-welding process. Where grounding conductors are connected to aluminum-composition conductors, specially treated or lined copper-to-aluminum connectors suitable for this purpose shall be used.

3.8.3 Grounding and Bonding Conductors

Grounding and bonding conductors include conductors used to bond transformer enclosures and equipment frames to the grounding electrode system. Grounding and bonding conductors shall be sized as shown, and located to provide maximum physical protection. Bends greater than 45 degrees in ground conductors are not permitted. Routing of ground conductors through concrete shall be avoided. When concrete penetration is necessary, nonmetallic conduit shall be cast flush with the points of concrete entrance and exit so as to provide an opening for the ground conductor, and the opening shall be sealed with a suitable compound after installation.

3.8.4 Surge Arrester Grounding

Surge arresters and neutrals shall be bonded directly to the transformer enclosure and then to the grounding electrode system with a bare copper conductor, sized as shown. Lead lengths shall be kept as short as practicable with no kinks or sharp bends.

3.8.5 Manhole, Handhole, or Concrete Pullbox Grounding

Ground rods installed in electrical-distribution-system manholes,

handholes, or concrete pullboxes shall be connected to cable racks, cable-pulling irons, the cable shielding, metallic sheath, and armor at each cable joint or splice by means of a No. 4 AWG braided tinned copper wire. Connections to metallic cable sheaths shall be by means of tinned terminals soldered to ground wires and to cable sheaths. Care shall be taken in soldering not to damage metallic cable sheaths or shields. Ground rods shall be protected with a double wrapping of pressure-sensitive plastic tape for a distance of 50 mm above and 150 mm below concrete penetrations. Grounding electrode conductors shall be neatly and firmly attached to manhole or handhole walls and the amount of exposed bare wire shall be held to a minimum.

3.9 FIELD TESTING

3.9.1 General

Field testing shall be performed in the presence of the Contracting Officer. The Contractor shall notify the Contracting Officer 15 days prior to conducting tests. The Contractor shall furnish all materials, labor, and equipment necessary to conduct field tests. The Contractor shall perform all tests and inspections recommended by the manufacturer unless specifically waived by the Contracting Officer. The Contractor shall maintain a written record of all tests which includes date, test performed, personnel involved, devices tested, serial number and name of test equipment, and test results. Field test reports shall be signed and dated by the Contractor.

3.9.2 Safety

The Contractor shall provide and use safety devices such as rubber gloves, protective barriers, and danger signs to protect and warn personnel in the test vicinity. The Contractor shall replace any devices or equipment which are damaged due to improper test procedures or handling.

3.9.3 Ground-Resistance Tests

The resistance of each grounding electrode, each grounding electrode system, the ground mat, the ground ring shall be measured using the fall-of-potential method defined in IEEE Std 81. Ground resistance measurements shall be made before the electrical distribution system is energized and shall be made in normally dry conditions not less than 48 hours after the last rainfall. Resistance measurements of separate grounding electrode systems shall be made before the systems are bonded together below grade. The combined resistance of separate systems may be used to meet the required resistance, but the specified number of electrodes must still be provided.

- a. Single rod electrode - 25 ohms.
- b. Multiple rod electrodes - 10 ohms.
- c. Ground mat - 10 ohms.
- d. Ground ring - 10 ohms.

3.9.4 Ground-Mat Connection Inspection

All below-grade ground-mat connections will be visually inspected by the Contracting Officer before backfilling. The Contractor shall notify the

Contracting Officer 24 hours before the site is ready for inspection.

3.9.5 Medium-Voltage Cable Test

After installation and before the operating test or connection to an existing system, the medium-voltage cable system shall be given a high potential test. Direct-current voltage shall be applied on each phase conductor of the system by connecting conductors as one terminal and connecting grounds or metallic shieldings or sheaths of the cable as the other terminal for each test. Prior to making the test, the cables shall be isolated by opening applicable protective devices and disconnecting equipment. The test shall be conducted with all splices, connectors, and terminations in place. The method, voltage, length of time, and other characteristics of the test for initial installation shall be in accordance with NEMA WC 7 or NEMA WC 8 for the particular type of cable installed, except that 28 kV and 35 kV insulation test voltages shall be in accordance with either AEIC CS5 or AEIC CS6 as applicable, and shall not exceed the recommendations of IEEE Std 404 for cable joints and IEEE Std 48 for cable terminations unless the cable and accessory manufacturers indicate higher voltages are acceptable for testing. Should any cable fail due to a weakness of conductor insulation or due to defects or injuries incidental to the installation or because of improper installation of cable, cable joints, terminations, or other connections, the Contractor shall make necessary repairs or replace cables as directed. Repaired or replaced cables shall be retested.

3.9.6 Low-Voltage Cable Test

Low-voltage cable, complete with splices, shall be tested for insulation resistance after the cables are installed, in their final configuration, ready for connection to the equipment, and prior to energization. The test voltage shall be 500 volts dc, applied for one minute between each conductor and ground and between all possible combinations of conductors in the same trench, duct, or cable, with all other conductors in the same trench, duct, or conduit. The minimum value of insulation shall be:

$$R \text{ in megohms} = \frac{(\text{rated voltage in kV} + 1) \times 304.8}{(\text{length of cable in meters})}$$

Each cable failing this test shall be repaired or replaced. The repaired cable shall be retested until failures have been eliminated.

3.9.7 Liquid-Filled Transformer Tests

The following field tests shall be performed on liquid-filled transformer. Pass-fail criteria shall be in accordance with transformer manufacturer's specifications.

- a. Insulation resistance test phase-to-ground.
- b. Turns ratio test.
- c. Correct phase sequence.
- d. Correct operation of tap changer.

3.9.8 Operating Tests

After the installation is completed, and at such times as the Contracting Officer may direct, the Contractor shall conduct operating tests for approval. The equipment shall be demonstrated to operate in accordance with the requirements herein. An operating test report shall be submitted in accordance with paragraph SUBMITTALS.

3.10 ACCEPTANCE

Final acceptance of the facility will not be given until the Contractor has successfully completed all tests and after all defects in installation, material or operation have been corrected.

-- End of Section --

SECTION 16415

ELECTRICAL WORK, INTERIOR

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI C12.1	(1988) Code for Electricity Metering
ANSI C12.4	(1984; R 1990) Mechanical Demand Registers
ANSI C12.10	(1987) Electromechanical Watthour Meters
ANSI C12.11	(1987) Instrument Transformers for Revenue Metering, 10 kV BIL through 350 kV (0.6 kV NSV through 69 kV NSV)
ANSI C12.16	(1991) Solid State Electricity Meters
ANSI C37.16	(1988; C37.16a) Low-Voltage Power Circuit Breakers and AC Power Circuit Protectors - Preferred Ratings, Related Requirements, and Application Recommendations
ANSI C39.1	(1981; R 1992) Electrical Analog Indicating Instruments
ANSI C57.12.10	(1988) 230 kV and Below 833/958 through 8333/10 417 kVA, Single-Phase, and 750/862 through 60 000/80 000/100 000 kVA, Three-Phase without Load Tap Changing; and 3750/4687 through 60 000/80 000/100 000 kVA with Load Tap Changing - Safety Requirements
ANSI C57.12.13	(1982) Conformance Requirements for Liquid-Filled Transformers Used in Unit Installations, Including Unit Substations
ANSI C57.12.27	(1982) Conformance Requirements for Liquid-Filled Distribution Transformers Used in Pad-Mounted Installations, Including Unit Substations
ANSI C57.12.50	(1981; R 1989) Ventilated Dry-Type Distribution Transformers, 1 to 500 kVA, Single-Phase, and 15 to 500 kVA, Three-Phase, with High-Voltage 601 to 34 500 Volts, Low-Voltage 120 to 600 Volts
ANSI C57.12.51	(1981; R 1989) Ventilated Dry-Type Power Transformers, 501 kVA and Larger, Three-Phase, with High-Voltage 601 to 34

	500 Volts, Low-Voltage 208Y/120 to 4160 Volts
ANSI C57.12.52	(1981; R 1989) Sealed Dry-Type Power Transformers, 501 kVA and Larger, Three-Phase, with High-Voltage 601 to 34 500 Volts, Low-Voltage 208Y/120 to 4160 Volts
ANSI C57.12.70	(1978; R 1993) Terminal Markings and Connections for Distribution and Power Transformers
ANSI C80.5	(1990) Rigid Aluminum Conduit
ANSI C82.1	(1985; C82.1a; C82.1b; C82.1c; R 1992) Ballasts for Fluorescent Lamps Specifications
ANSI C82.4	(1992) Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps (Multiple-Supply Type)
ANSI C135.30	(1988) Zinc-Coated Ferrous Ground Rods for Overhead or Underground Line Construction

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 709	(1992) Laminated Thermosetting Materials
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CODE OF FEDERAL REGULATIONS (CFR)

47 CFR 18	Rules and Regulations: Industrial, Scientific, and Medical Equipment
47 CFR 68	Connection of Terminal Equipment to the Telephone Network

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C37.13	(1990) Low-Voltage AC Power Circuit Breakers Used in Enclosures
IEEE C37.20.1	(1993) Metal-Enclosed Low-Voltage Power Circuit-Breaker Switchgear
IEEE C57.12.00	(1993) IEEE Standard General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers
IEEE C57.12.01	(1989) Dry-Type Distribution and Power Transformers Including Those With Solid Cast and/or Resin - Encapsulated Windings
IEEE C57.12.80	(1978; R 1992) Terminology for Power and Distribution Transformers
IEEE C57.12.90	(1993) Test Code for Liquid-Immersed Distribution, Power, and Regulating

Transformers and Guide for Short-Circuit
Testing of Distribution and Power
Transformers

IEEE C57.12.91	(1979) Test Code for Dry-Type Distribution and Power Transformers
IEEE C57.13	(1993) Instrument Transformers
IEEE C57.94	(1982; R 1987) Installation, Application, Operation and Maintenance of Dry-Type General Purpose Distribution and Power Transformers
IEEE C57.98	(1993) Guide for Transformer Impulse Tests
IEEE C57.100	(1986; R 1992) Test Procedure for Thermal Evaluation of Oil-Immersed Distribution Transformers
IEEE C57.105	(1978; R 1992) Transformer Connections in Three-Phase Distribution Systems
IEEE C62.41	(1991) Surge Voltages in Low-Voltage AC Power Circuits
IEEE Std 81	(1983) Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System (Part 1)

INSULATED CABLE ENGINEERS ASSOCIATION (ICEA)

ICEA S-80-576	(1988) Communications Wire and Cable for Wiring of Premises
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NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250	(1991) Enclosures for Electrical Equipment (1000 Volts Maximum)
NEMA AB 1	(1993) Molded Case Circuit Breakers and Molded Case Switches
NEMA BU 1	(1994) Busways
NEMA FU 1	(1986) Low Voltage Cartridge Fuses
NEMA ICS 1	(1993) Industrial Controls and Systems
NEMA ICS 2	(1993) Industrial Control Devices, Controllers and Assemblies
NEMA ICS 3	(1993) Industrial Systems
NEMA ICS 6	(1993) Enclosures for Industrial Control and Systems
NEMA LE 4	(1987) Recessed Luminaires, Ceiling

Compatibility

NEMA MG 1	(1993; Rev 1-1993; Rev 2-1995) Motors and Generators
NEMA MG 10	(1994) Energy Management Guide for Selection and Use of Polyphase Motors
NEMA OS 1	(1989) Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports
NEMA OS 2	(1986; Errata Aug 1986; R 1991) Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports
NEMA PB 1	(1990) Panelboards
NEMA PB 2	(1989) Deadfront Distribution Switchboards
NEMA PE 5	(1985; R 1991) Utility Type Battery Chargers
NEMA PE 7	(1985; R 1991) Communication Type Battery Chargers
NEMA RN 1	(1989) Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit
NEMA ST 20	(1992) Dry-Type Transformers for General Applications
NEMA TC 2	(1990) Electrical Polyvinyl Chloride (PVC) Tubing (EPT) and Conduit (EPC-40 and EPC-80)
NEMA TC 13	(1993) Electrical Nonmetallic Tubing (ENT)
NEMA WD 1	(1983; R 1989) General Requirements for Wiring Devices
NEMA WD 6	(1988) Wiring Devices - Dimensional Requirements

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(1996) National Electrical Code
NFPA 101	(1994) Safety to Life from Fire in Buildings and Structures

RURAL ELECTRIFICATION ADMINISTRATION (REA)

REA TE&CM 823	(1980) Electrical Protection by Use of Gas Tube Arresters
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UNDERWRITERS LABORATORIES (UL)

UL-03	(1995) Electrical Construction Materials
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Directory

UL 1	(1993; Rev thru Jan 1995) Flexible Metal Conduit
UL 5	(1995) Surface Metal Raceways and Fittings
UL 6	(1993) Rigid Metal Conduit
UL 20	(1995) General-Use Snap Switches
UL 44	(1991; Rev thru Jan 1995) Rubber-Insulated Wires and Cables
UL 50	(1992; Rev thru Nov 1994) Enclosures for Electrical Equipment
UL 67	(1993; Rev thru Dec 1993) Panelboards
UL 83	(1991; Rev thru Oct 1994) Thermoplastic-Insulated Wires and Cables
UL 94	(1991; Rev thru Apr 1995) Tests for Flammability of Plastic Materials for Parts in Devices and Appliances
UL 98	(1994; R Feb 1995) Enclosed and Dead-Front Switches
UL 198B	(1995) Class H Fuses
UL 198C	(1986; Rev thru Jun 1993) High-Interrupting-Capacity Fuses, Current-Limiting Types
UL 198D	(1995) Class K Fuses
UL 198E	(1988; Rev Jul 1988) Class R Fuses
UL 198G	(1988; Rev May 1988) Fuses for Supplementary Overcurrent Protection
UL 198H	(1988; Rev thru Nov 1993) Class T Fuses
UL 198L	(1995) D-C Fuses for Industrial Use
UL 360	(1986; Rev thru Dec 1994) Liquid-Tight Flexible Steel Conduit
UL 467	(1993) Grounding and Bonding Equipment
UL 486A	(1991; Rev Oct 1991) Wire Connectors and Soldering Lugs for Use with Copper Conductors
UL 486B	(1991; Rev thru Apr 1992) Wire Connectors for Use with Aluminum Conductors
UL 486C	(1991; Rev thru Sep 1992) Splicing Wire

Connectors

UL 489	(1991; Rev thru Jun 1995) Molded-Case Circuit Breakers and Circuit-Breaker Enclosures
UL 497	(1995) Protectors for Paired Conductor Communication Circuits
UL 498	(1991; Rev thru Oct 1994) Attachment Plugs and Receptacles
UL 506	(1994; Rev Jul 1994) Specialty Transformers
UL 508	(1993) Industrial Control Equipment
UL 510	(1994) Insulating Tape
UL 512	(1993) Fuseholders
UL 514A	(1991; Rev Apr 1995) Metallic Outlet Boxes
UL 514B	(1992; Rev thru Apr 1995) Fittings for Conduit and Outlet Boxes
UL 514C	(1988; Rev Apr 1995) Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
UL 542	(1994) Lampholders, Starters, and Starter Holders for Fluorescent Lamps
UL 651	(1989; Rev thru Dec 1989) Schedule 40 and 80 Rigid PVC Conduit
UL 651A	(1995) Type EB and A Rigid PVC Conduit and HDPE Conduit
UL 674	(1994; Rev Jul 1995) Electric Motors and Generators for Use in Division 1 Hazardous (Classified) Locations
UL 698	(1995) Industrial Control Equipment for Use in Hazardous (Classified) Locations
UL 719	(1985; Rev thru Dec 1994) Nonmetallic-Sheathed Cables
UL 797	(1993; Rev May 1995) Electrical Metallic Tubing
UL 817	(1994; Rev thru Aug 1994) Cord Sets and Power-Supply Cords
UL 844	(1995) Electric Lighting Fixtures for Use in Hazardous (Classified) Locations
UL 845	(1995) Motor Control Centers
UL 857	(1994) Busways and Associated Fittings

UL 869A	(1993; Rev Apr 1994) Reference Standard for Service Equipment
UL 877	(1993) Circuit Breakers and Circuit-Breaker Enclosures for Use in Hazardous (Classified) Locations
UL 886	(1994; Rev thru Jul 1995) Outlet Boxes and Fittings for Use in Hazardous (Classified) Locations
UL 891	(1994; Rev thru Jan 1995) Dead-Front Switchboards
UL 924	(1995) Emergency Lighting and Power Equipment
UL 935	(1995; Rev Jun 1995) Fluorescent-Lamp Ballasts
UL 943	(1993; Rev thru Jan 1995) Ground-Fault Circuit Interrupters
UL 1004	(1994) Electric Motors
UL 1010	(1995) Receptical-Plug Combinations for Use in Hazardous (Classified) Locations
UL 1022	(1994) Line Isolation Monitors
UL 1029	(1994; Rev Oct 1994) High-Intensity-Discharge Lamp Ballasts
UL 1047	(1995) Isolated Power Systems Equipment
UL 1236	(1994; Rev thru Jun 1995) Battery Chargers for Charging Engine-Starter Batteries
UL 1242	(1983; Rev thru Jul 1993) Intermediate Metal Conduit
UL 1561	(1994; Rev Jul 1995) Dry-Type General Purpose Power Transformers
UL 1564	(1993; Rev Apr 1994) Industrial Battery Chargers
UL 1570	(1988; Rev thru Mar 1995) Fluorescent Lighting Fixtures
UL 1571	(1991; Rev thru Mar 1995) Incandescent Lighting Fixtures
UL 1572	(1991; Rev thru Mar 1995) High Intensity Discharge Lighting Fixtures
UL 1660	(1994) Liquid-Tight Flexible Nonmetallic Conduit

1.2 GENERAL

1.2.1 Rules

The installation shall conform to the requirements of NFPA 70 and NFPA 101, unless more stringent requirements are indicated herein or shown.

1.2.2 Coordination

The drawings indicate the extent and the general location and arrangement of equipment, conduit, and wiring. The Contractor shall become familiar with all details of the work and verify all dimensions in the field so that the outlets and equipment shall be properly located and readily accessible.

Lighting fixtures, outlets, and other equipment and materials shall be located to avoid interference with mechanical or structural features; otherwise, lighting fixtures shall be symmetrically located according to the room arrangement when uniform illumination is required, or asymmetrically located to suit conditions fixed by design and shown. Raceways, junction and outlet boxes, and lighting fixtures shall not be supported from sheet metal roof decks. If any conflicts occur necessitating departures from the drawings, details of and reasons for departures shall be submitted and approved prior to implementing any change. The Contractor shall coordinate the electrical work with HVAC and electrical drawings and provide all power related wiring even if they are not shown on electrical drawings.

1.2.3 Standard Products

Material and equipment shall be a standard product of a manufacturer regularly engaged in the manufacture of the product and shall essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening.

1.2.4 Identification Nameplates

Major items of electrical equipment and major components shall be permanently marked with an identification name to identify the equipment by type or function and specific unit number as indicated. Designation of motors shall coincide with their designation in their panel. Unless otherwise specified, all identification nameplates shall be made of laminated plastic in accordance with ASTM D 709 with black outer layers and a white core. Edges shall be chamfered. Plates shall be fastened with black-finished round-head drive screws, except motors, or approved nonadhesive metal fasteners. When the nameplate is to be installed on an irregular-shaped object, the Contractor shall devise an approved support suitable for the application and ensure the proper installation of the supports and nameplates. In all instances, the nameplate shall be installed in a conspicuous location. At the option of the Contractor, the equipment manufacturer's standard embossed nameplate material with black paint-filled letters may be furnished in lieu of laminated plastic. The front of each panelboard shall have a nameplate to indicate the phase letter, corresponding color and arrangement of the phase conductors. The following equipment, as a minimum, shall be provided with identification nameplates:

Minimum 6.4 mm
High Letters

Minimum 3.2 mm
High Letters

Panelboards
 Starters
 Safety Switches
 Transformers
 Equipment Enclosures
 Motors

Control Power Transformers
 Control Devices

Each panel similar assemblies shall be provided with a nameplate in addition to nameplates listed above, which shall be provided for individual compartments in the respective assembly, including nameplates which identify "future," "spare," and "dedicated" or "equipped spaces."

1.2.5 As Built Drawings

Following the project completion or turnover, within 30 days the Contractor shall furnish two sets of as built drawings to the Contracting Officer.

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL PROCEDURES:

SD-04 Drawings

Electrical Work; FIO.

Detail drawings for all materials and equipment specified. Detail drawings shall consist of a complete list of equipment and materials, including manufacturer's descriptive and technical data; catalog cuts; and any special installation instructions that may be required. Drawings shall show applicable schematic diagrams; equipment layout and anchorage ; and conduit anchorage, and support. Telephone system drawings showing actual layout, including locations, type any gauge of cables, and terminal assignment of wiring, after installation.

SD-09 Reports

Materials and Equipment; FIO.

The label or listing of the Underwriters Laboratories, Inc., shall be accepted as evidence that the materials or equipment conform to the applicable standards of that agency. In lieu of this label or listing, a statement from a nationally recognized, adequately equipped testing agency indicating that the items have been tested in accordance with required procedures and that the materials and equipment comply with all contract requirements will be accepted. Materials and equipment shall be approved based on the manufacturer's published data.

For other than equipment and materials specified to conform to UL publications, a manufacturer's statement indicating complete compliance with the applicable Federal Specification, or standard of the American Society for Testing and Materials, National Electrical Manufacturers Association, or other commercial standard, is acceptable.

SD-13 Certificates

Telephone Installer; FIO.

Qualifications of the telephone installer.

1.4 WORKMANSHIP

Materials and equipment shall be installed in accordance with recommendations of the manufacturer and as shown.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

Materials and equipment shall conform to the respective publications and other requirements specified below. Materials and equipment not listed below shall be as specified elsewhere in this section.

2.1.1 Cables and Wires

Conductors in cables shall be annealed copper, except that AA-8000 series aluminum conductors may be used as an equivalent for copper conductors of No. 6 AWG or larger. Intermixing of copper and aluminum conductors in these sizes is not permitted. Design is based on copper conductors and aluminum conductors shall have an ampacity not less than that of the indicated copper conductors. Cables shall be single-conductor type, unless otherwise indicated. Cables and wires shall conform to UL 44 for rubber-insulated type; and UL 83 for the thermoplastic-insulated type. The following types shall be provided.

2.1.2 Service Entrance Cable

Type USE.

2.1.3 Grounding Cables

Grounding cables shall be bare or shall have green low-voltage insulation.

2.1.4 Cord Sets and Power-Supply Cords

UL 817.

2.1.5 Telephone Cables

ICEA S-80-576

2.1.6 Cabinets for Communications

UL 50. Cabinets shall have boxes constructed of zinc-coated sheet steel. Cabinets shall be constructed with interior dimensions not less than those indicated. Trim shall be fitted with hinged door and flush catch. Doors shall provide maximum-size openings to the box interiors. Boxes shall be provided with a 15 mm plywood back board having a two-coat insulating varnish finish.

2.1.7 Connector Blocks

Connector blocks shall be type 66 equipped with punch down clips.

2.1.8 Telephone Backboards

Backboards shall be 15 mm plywood having a two-coat insulating varnish finish.

2.1.1.9 Protector Modules

The protector modules shall be of the three-electrode gas tube type. Protection modules shall be heavy duty as specified in REA TE&CM 823. The gas modules shall be fail-short and shall shunt high voltage to ground in less than 10 nanoseconds, shall have an external spark gap, and shall comply with UL 497.

2.1.1.10 Chargers, Battery

NEMA PE 5 and NEMA PE 7. Battery chargers shall be general purpose, continuous current output, with solid state rectifiers. Means shall be provided to regulate and to adjust the dc output voltage. Chargers shall have continuous current ratings of 10 to 15 percent higher than battery current outputs based upon an 8-hour discharge.

2.1.1.11 Circuit Breakers

Circuit breakers shall have voltage, current and interrupting ratings as indicated. Fully rated circuit breakers shall be provided to obtain the specified interrupting rating. Fully rated circuit breakers or series rated circuit breakers in combinations approved for series applications by UL shall be provided as indicated, for specific pieces of distribution equipment, to obtain the specified interrupting rating. Panelboards or individual enclosures containing series rated circuit breakers shall be appropriately marked for use with the specified breakers at the designated short circuit level.

2.1.1.1.1 Molded-Case Breakers

NEMA AB 1 and UL 489 for circuit breakers.

- a. Molded-Case Circuit Breakers: Single-pole breakers shall be full module size; two poles shall not be installed in a single module. Multipole breakers shall be of the common-trip type having a single operating handle, but for sizes of 100 amperes or less may consist of single-pole breakers permanently factory assembled into a multipole unit having an internal, mechanical, nontamperable common-trip mechanism and external handle ties. Breakers coordinated with current-limiting fuses shall have a combined interrupting capacity of 100,000 symmetrical amperes. All poles of associated breakers shall open if any fuse blows.

2.1.1.12 Conduit and Tubing

2.1.1.12.1 Electrical, Zinc-Coated Steel Metallic Tubing (EMT)

UL 797.

2.1.1.12.2 Flexible Conduit, Steel and Plastic

General-purpose type, UL 1; liquid tight, UL 360, and UL 1660

2.1.1.12.3 Intermediate Metal Conduit

UL 1242.

2.1.12.4 PVC Coated Rigid Steel Conduit

NEMA RN 1.

2.1.12.5 Rigid Metal Conduit

UL 6.

2.1.12.6 Rigid Plastic

NEMA TC 2, UL 651 and UL 651A.

2.1.13 Conduit and Device Boxes and Fittings

2.1.13.1 Boxes, Metallic Outlet

NEMA OS 1 and UL 514A.

2.1.13.2 Boxes, Switch (Enclosed), Surface-Mounted

UL 98.

2.1.13.3 Fittings for Conduit and Outlet Boxes

UL 514B.

2.1.13.4 Fittings, PVC, for Use with Rigid PVC Conduit and Tubing

UL 514B.

2.1.14 Conduit Coatings Plastic Resin System

NEMA RN 1, Type A-40.

2.1.15 Connectors, Wire Pressure

2.1.15.1 Copper Conductors

UL 486A.

2.1.15.2 Aluminum Conductors

UL 486B.

2.1.16 Electrical Grounding and Bonding Equipment

UL 467.

2.1.16.1 Ground Rods

Ground rods shall be of copper-clad steel conforming to UL 467 not less than 19.1 mm (3/4 inch) in diameter by 3.1 meter (10 feet) in length of the sectional type driven full length into the earth.

2.1.16.2 Ground Bus

The ground bus shall be bare conductor or flat copper in one piece, if practicable.

2.1.17 Enclosures

NEMA ICS 6 unless otherwise specified.

2.1.17.1 Cabinets and Boxes, Volume Greater Than 0.00164 Cubic Meters

UL 50, hot-dip, zinc-coated, if sheet steel.

2.1.17.2 Circuit Breaker

UL 489.

2.1.18 Fixtures, Lighting and Fixture Accessories/Components

Standard Drawing 40-06-04 sheets referenced hereinafter and enclosed as an integral part of these specifications, additional fixtures shown on contract drawings, if any. Fixtures, accessories and components, including ballasts, lampholders, lamps, starters and starter holders, shall conform to industry standards specified below.

2.1.18.1 Fixture, Auxiliary or Emergency

UL 924.

2.1.18.2 Incandescent Fixture

NEMA LE 4 for ceiling compatibility of recessed fixtures and UL 1571.

2.1.18.3 Fluorescent

- a. Fixture: NEMA LE 4 for ceiling compatibility of recessed fixtures and UL 1570. Fixtures shall be plainly marked for proper lamp and ballast type to identify lamp diameter, wattage, color and start type. Marking shall be readily visible to service personnel, but not visible from normal viewing angles.

- b. Ballasts:

Electronic Ballast. Electronic ballasts shall consist of a rectifier, high frequency inverter, and power control and regulation circuitry. The ballasts shall be UL listed, Class P, with a Class A sound rating and shall contain no PCBs. Ballasts shall meet 47 CFR 18 for electromagnetic interference and shall not interfere with the operation of other electrical equipment. Design shall withstand line transients per IEEE C62.41, Category A. Unless otherwise indicated, the minimum number of ballasts shall be used to serve each individual fixture, using one, two, three or four lamp ballasts. A single ballast may be used to serve multiple fixtures if they are continuous mounted, factory manufactured for that installation with an integral wireway and are identically controlled.

- (a) Light output regulation shall be +/- 10%.
- (b) Voltage input regulation shall be +/- 10%.
- (c) Lamp current crest factor shall be no more than 1.7.
- (d) Ballast factor shall be not less than 85% nor more than 100%, unless otherwise indicated.
- (e) A 60 Hz filter shall be provided. Flicker shall be no more than

- 15% with any lamp suitable for the ballast.
- (f) Ballast case temperature shall not exceed 25 degree celsius rise above 40 degree celsius ambient, when tested in accordance with UL 935.
 - (g) Input current third harmonic shall not exceed 20 percent total harmonic distortion.
 - (h) Power factor shall not be less than 0.95.
 - (i) Ballasts shall operate at a frequency of 20 KHz or more.
 - (j) Operating filament voltage shall be 2.5 to 4.5 volts.
 - (k) Warranty. Three year full warranty including a \$10 labor allowance.
 - (l) Ballast Efficacy Factor (BEF) shall be in accordance with the following table. Ballasts and lamps shall be matching rapid start or instant start as indicated on the following table. If 32W-F32-T8 lamps and ballasts are used, they must be either all rapid start or all instant start.

ELECTRONIC FLUORESCENT BALLAST EFFICACY FACTORS

LAMP TYPE	TYPE OF STARTER & LAMP	NOMINAL OPERATIONAL INPUT VOLTAGE	NUMBER OF LAMPS	MIN. BALLAST EFFICACY FACTOR
32W F32 T8	rapid or instant start	120 or 277 V	1	2.4
			2	1.4
			3	1.0
			4	0.8

*For ballasts not specifically designed for use with dimming controls

The BEF is calculated using the formula:

BEF = Ballast Factor (in percent) / Power Input

Where Power Input = Total Wattage of Combined Lamps and Ballasts.

c. Lampholders, Starters, and Starter Holders: UL 542.

2.1.18.4 High-Intensity-Discharge

a. Fixture: NEMA LE 4 for ceiling compatibility of recessed fixtures and UL 1572.

b. Ballasts: ANSI C82.4 for multiple supply types and UL 1029.

2.1.19 Fuses and Fuseholders

2.1.19.1 Fuses, Low Voltage Cartridge Type

NEMA FU 1.

2.1.19.2 Fuses, High-Interrupting-Capacity, Current-Limiting Type

UL 198C.

2.1.19.3 Fuses, Class K, High-Interrupting-Capacity Type

UL 198D.

2.1.19.4 Fuses, Class H

UL 198B.

2.1.19.5 Fuses, Class R

UL 198E.

2.1.19.6 Fuses, Class T

UL 198H.

2.1.19.7 Fuses for Supplementary Overcurrent Protection

UL 198G.

2.1.19.8 Fuses, D-C for Industrial Use

UL 198L.

2.1.19.9 Fuseholders

UL 512.

2.1.20 Motors, ac, Fractional and Integral

Motors, ac, fractional and integral kilowatt, 373.0 kW (500 hp) and smaller shall conform to NEMA MG 1 and UL 1004 for motors; and NEMA MG 10 for energy management selection of polyphase motors.

2.1.20.1 Rating

The kilowatt (horsepower) rating of motors should be limited to no more than 125 percent of the maximum load being served unless a NEMA standard size does not fall within this range. In this case, the next larger NEMA standard motor size should be use

2.1.20.2 Motor Efficiencies

All permanently wired polyphase motors of 746 W (1 hp) or more shall meet the minimum full-load efficiencies as indicated in the following table, and as specified in this specification. Motors of 746 W (1 hp) or more with open, drip-proof or totally enclosed fan cooled enclosures shall be high efficiency type, unless otherwise indicated. Motors provided as an integral part of motor driven equipment are excluded from this requirement if a minimum seasonal or overall efficiency requirement is indicated for that equipment by the provisions of another section.

Minimum Motor Efficiencies

kW	Std. Efficiency	High Efficiency
0.746 (1 hp)	77.0	85.5
1.12 (1.5 hp)	78.5	85.5
1.49 (2 hp)	78.5	85.5
2.24 (3 hp)	78.5	88.5

Minimum Motor Efficiencies

kW	Std. Efficiency	High Efficiency
3.73 (5 hp)	82.5	88.5
5.60 (7.5 hp)	84.0	90.0
7.46 (10 hp)	85.5	90.0
11.2 (15 hp)	85.5	91.0
14.9 (20 hp)	87.5	92.0
18.7 (25 hp)	88.5	92.0
22.4 (30 hp)	88.5	92.0
29.8 (40 hp)	88.5	92.0
37.3 (50 hp)	89.0	92.5

2.1.21 Panelboards

Dead-front construction, NEMA PB 1 and UL 67.

2.1.22 Receptacles

2.1.22.1 Specification Grade

NEMA WD 1.

2.1.22.2 Service Equipment

UL 869A.

2.1.22.3 Splice, Conductor

UL 486C.

2.1.22.4 Snap Switches

UL 20.

2.1.22.5 Tapes

2.1.22.5.1 Plastic Tape

UL 510.

2.2 Rubber Tape

UL 510.

2.3 Transformers

2.3.1 Conventional Dry-Type

IEEE C57.12.01, ANSI C57.12.10, IEEE C57.12.80, IEEE C57.12.91, IEEE C57.94, IEEE C57.98, IEEE C57.105 and UL 1561 in addition to the specific standards referenced below.

- a. Distribution: Ventilated, 1 to 500 kVA, single-phase, and 15 to 500 kVA, three-phase with high-voltage 601 to 34500 volts, low-voltage 120-600 volts: ANSI C57.12.50.

2.3.2 Epoxy-Resin-Cast, Dry-Type

IEEE C57.12.01, ANSI C57.12.10, IEEE C57.12.80, IEEE C57.12.91, IEEE C57.94, IEEE C57.98, IEEE C57.105, and UL 1561 in addition to the specific standards referenced below.

- a. Distribution: Ventilated, 1 to 500 kVA, single-phase, and 15 to 500 kVA, three-phase with high-voltage 601 to 34500 volts, low-voltage 120-600 volts: ANSI C57.12.50.

2.4 Watthour Meters

Watthour meters shall conform to ANSI C12.1, ANSI C12.10, and ANSI C12.16, except numbered terminal wiring sequence and case size may be the manufacturer's standard. Watthour meters shall be of the socket-mounted outdoor type having a 15-minute, cumulative form, demand register meeting ANSI C12.4 and provided with not less than two and one-half staters. Watthour demand meters shall have factory-installed electronic pulse initiators meeting the requirements of ANSI C12.1. Pulse initiators shall be solid-state devices incorporating light-emitting diodes, phototransistors, and power transistors, except that mercury-wetted output contacts are acceptable. Initiators shall be totally contained within watthour demand meter enclosures, shall be capable of operating up to speeds of 500 pulses per minute with no false pulses, and shall require no field adjustments. Initiators shall be calibrated for a pulse rate output of one pulse of the associated meter and shall be compatible with the indicated equipment. Meter shall include a liquid crystal display (LCD) and provide pulses on the KYZ leads.

2.5 Wiring Devices

NEMA WD 1 for general-purpose wiring devices, and NEMA WD 6 for dimensional requirements of wiring devices.

2.6 Telephone Jacks

47 CFR 68, plastic shall be class VO in accordance with UL 94.

PART 3 EXECUTION

3.1 GROUNDING

Grounding shall be in conformance with NFPA 70, the contract drawings, and the following specifications.

3.1.1 Ground Rods

The resistance to ground shall be measured using the fall-of-potential method described in IEEE Std 81. The maximum resistance of a driven ground shall not exceed 25 ohms under normally dry conditions. If this resistance cannot be obtained with a single rod, additional rods not less than 1.8 meters on centers, or if sectional type rods are used, additional sections may be coupled and driven with the first rod. In high-ground-resistance, UL listed chemically charged ground rods may be used. If the resultant resistance exceeds 25 ohms measured not less than 48 hours after rainfall, the Contracting Officer shall be notified immediately. Connections below grade shall be fusion welded. Connections above grade shall be fusion welded or shall use UL 467 approved connectors.

3.1.2 Grounding Conductors

A green ground wire shall be furnished regardless of the type of conduit. All equipment grounding conductors, including metallic raceway systems used as such, shall be bonded or joined together in each wiring box or equipment enclosure. Metallic raceways and grounding conductors shall be checked to assure that they are wired or bonded into a common junction. Metallic boxes and enclosures, if used, shall also be bonded to these grounding conductors by an approved means per NFPA 70. When boxes for receptacles, switches, or other utilization devices are installed, any designated grounding terminal on these devices shall also be bonded to the equipment grounding conductor junction with a short jumper.

3.2 WIRING METHODS

3.2.1 General Requirements

Unless otherwise indicated, wiring shall consist of insulated conductors installed in rigid zinc-coated steel conduit, rigid electrical metallic and intermediate metal conduit.

3.2.2 Conduit and Tubing Systems

Conduit and tubing systems shall be installed as indicated. Conduit sizes shown are based on use of copper conductors with insulation types as described in paragraph WIRING METHODS. Minimum size of raceways shall be 16 mm. Only metal conduits will be permitted when required by conformance to NFPA 70. Nonmetallic flexible conduit may be used in damp, wet or corrosive locations when permitted by NFPA 70 and the conduit system is provided with appropriate boxes, covers, clamps, screws or other appropriate type of fittings. Electrical metallic tubing may be installed only within buildings. Electrical metallic tubing may be installed in concrete and grout in dry locations. Electrical metallic tubing installed in concrete or grout shall be provided with concrete tight fittings. EMT shall not be installed in damp or wet locations, or the air space of exterior masonry cavity walls. Bushings, manufactured fittings or boxes providing equivalent means of protection shall be installed on the ends of all conduits and shall be of the insulating type, where required by NFPA 70.

Only UL listed adapters shall be used to connect EMT to rigid metal conduit, cast boxes, and conduit bodies. Aluminum conduit may be used only where installed exposed in dry locations. Nonaluminum sleeves shall be used where aluminum conduit passes through concrete floors and firewalls. Penetrations of above grade floor slabs, time-rated partitions and fire walls shall be firestopped in accordance with Section 07270 FIRESTOPPING. Except as otherwise specified, IMC may be used as an option for rigid steel conduit in areas as permitted by NFPA 70. Raceways shall not be installed under the firepits of boilers and furnaces and shall be kept 150 mm away from parallel runs of flues, steam pipes and hot-water pipes. Raceways shall be concealed within finished walls, ceilings, and floors unless otherwise shown. Raceways crossing structural expansion joints shall be provided with suitable expansion fittings or other suitable means to compensate for the building expansion and contraction and to provide for continuity of grounding.

3.2.2.1 Below Slab-on-Grade or in the Ground

Electrical wiring below slab-on-grade shall be protected by a conduit system. Conduit passing vertically through slabs-on-grade shall be rigid steel or IMC. Rigid steel or IMC conduits installed below slab-on-grade or

in the earth shall be field wrapped with 0.254 mm thick pipe-wrapping plastic tape applied with a 50 percent overlay, or shall have a factory-applied polyvinyl chloride, plastic resin, or epoxy coating system.

3.2.2.2 Installing in Slabs Including Slabs on Grade

Conduits shall be installed as close to the middle of concrete slabs as practicable without disturbing the reinforcement. Outside diameter shall not exceed 1/3 of the slab thickness and conduits shall be spaced not closer than 3 diameters on centers except at cabinet locations where the slab thickness shall be increased as approved by the Contracting Officer.

3.2.2.3 Exposed Raceways

Exposed raceways shall be installed parallel or perpendicular to walls, structural members, or intersections of vertical planes and ceilings. Raceways under raised floors and above accessible ceilings shall be considered as exposed installations in accordance with NFPA 70 definitions.

3.2.2.4 Changes in Direction of Runs

Changes in direction of runs shall be made with symmetrical bends or cast-metal fittings. Field-made bends and offsets shall be made with an approved hickey or conduit-bending machine. Crushed or deformed raceways shall not be installed. Trapped raceways in damp and wet locations shall be avoided where possible. Care shall be taken to prevent the lodgment of plaster, dirt, or trash in raceways, boxes, fittings and equipment during the course of construction. Clogged raceways shall be entirely freed of obstructions or shall be replaced.

3.2.2.5 Supports

Metallic conduits and tubing shall be securely and rigidly fastened in place at intervals of not more than 3 meters and within 900 mm of boxes, cabinets, and fittings, with approved pipe straps, wall brackets, conduit clamps, conduit hangers, threaded C-clamps, or ceiling trapeze. C-clamps or beam clamps shall have strap or rod-type retainers. Rigid plastic conduits (if permitted as a wiring method) shall be supported as indicated above, except that they will be supported at intervals as indicated in NFPA 70. Loads and supports shall be coordinated with supporting structure to prevent damage or deformation to the structures, but no load shall be applied to joist bridging. Fastenings shall be by wood screws or screw-type nails to wood; by toggle bolts on hollow masonry units; by expansion bolts on concrete or brick; by machine screws, welded threaded studs, heat-treated or spring-steel-tension clamps on steel work. Nail-type nylon anchors or threaded studs driven in by a powder charge and provided with lock washers and nuts may be used in lieu of expansion bolts or machine screws. Raceways or pipe straps shall not be welded to steel structures. Holes cut to a depth of more than 40 mm in reinforced concrete beams or to a depth of more than 20 mm in concrete joists shall avoid cutting the main reinforcing bars. Holes not used shall be filled. In partitions of light steel construction, sheet-metal screws may be used. Conduit and tubing shall not be supported using wire or nylon ties. Raceways shall be installed as a complete system and be independently supported from the structure. Upper raceways shall not be the support of lower raceways. Supporting means will not be shared between electrical raceways and mechanical piping or ducts and shall not be fastened to hung ceiling supports. Conduits shall be fastened to all sheet-metal boxes and cabinets with two locknuts where required by the NFPA 70, where insulating

bushings are used, and where bushings cannot be brought into firm contact with the box; otherwise, a single locknut and bushing may be used. Threadless fittings for electrical metallic tubing shall be of a type approved for the conditions encountered. A pull wire shall be inserted in each empty raceway in which wiring is to be installed by others if the raceway is more than 15 meters in length and contains more than the equivalent of two 90-degree bends, or where the raceway is more than 45 meters in length. The pull wire shall be of No. 14 AWG zinc-coated steel, or of plastic having not less than 1.4 MPa (200 psi) tensile strength. Not less than 254 mm (10 inches) of slack shall be left at each end of the pull wire. Additional support for horizontal runs is not required when EMT rests on steel stud cutouts.

3.2.2.6 Communications Raceways

Communications raceways indicated shall be installed in accordance with the previous requirements for conduit and tubing and with the additional requirements that no length of run shall exceed 15 meters for 15 mm (1/2 inch) and 20 mm (3/4 inch) sizes, and 30 meters for 25 mm (1 inch) or larger sizes, and shall not contain more than two 90-degree bends or the equivalent. Additional pull or junction boxes shall be installed to comply with these limitations whether or not indicated. Inside radii of bends in conduits of 25 mm (1 inch) size or larger shall be not less than ten times the nominal diameter.

3.2.2.7 Cables and Conductors

Aluminum conductors shall have ampacity of not less than the copper conductors. Wire connectors of insulating material or solderless pressure connectors properly taped shall be utilized for all splices. Pressure connectors for aluminum conductors shall have tinned aluminum bodies. Aluminum contact surfaces of conductors and connectors shall be cleaned and covered with antioxidant compound prior to making of connections.

3.2.2.7.1 Sizes

All sizes are based on copper conductors, unless otherwise indicated. Sizes shall be not less than indicated. Branch-circuit conductors shall be not smaller than No. 12 AWG. Conductors for branch circuits of 120 volts more than 30 meters long and of 277 volts more than 70 meters long, from panel to load center, shall be no smaller than No. 10 AWG. Class 1 remote control and signal circuit conductors shall be not less than No. 14 AWG. Class 2 remote control and signal circuit conductors shall be not less than No. 16 AWG.

The conductor sizes are based on the use of TW insulation for conductors smaller than No. 1/0 AWG and THW insulation for conductors No. 1/0 and larger, except where otherwise indicated.

Higher temperature rated conductors will be permitted to be used, if the UL tested temperature ratings for which the equipment in the circuit is marked are not exceeded.

Conductor sizes for nonlinear loads shall be based on the use of minimum 75 degrees C insulated conductors for branch circuits and feeders.

3.3 Power Conductor Identification

Phase conductors shall be identified by color coding. The color of the

insulation on phases A, B, and C respectively (for three phase) or phases A and B respectively (for single phase) of different voltage systems shall be as follows:

120/240 volt, 3-phase: Black, red, and blue.

277/480 volt, 3-phase: Brown, orange, and yellow.

Conductor phase and voltage identification shall be made by color-coded insulation for all conductors smaller than No. 6 AWG. For conductors No. 6 AWG and larger, identification shall be made by color-coded insulation, or conductors with black insulation may be furnished and identified by the use of half-lapped bands of colored electrical tape wrapped around the insulation for a minimum of 75 mm of length near the end, or other method as submitted by the Contractor and approved by the Contracting Officer. Conductor identification shall be provided within each enclosure where a tap, splice, or termination is made. Phase identification by a particular color shall be maintained continuously for the length of a circuit, including junctions.

3.4 Control Conductor Identification

Control circuit conductor identification shall be made by color-coded insulated conductors, plastic-coated self-sticking printed markers, permanently attached stamped metal foil markers, or equivalent means as approved. Control circuit terminals of equipment shall be properly identified. Terminal and conductor identification shall match that shown on approved detail drawings. Hand lettering or marking is not acceptable.

3.5 BOXES AND SUPPORTS

Boxes shall be provided in the wiring or raceway systems wherever required for pulling of wires, making connections, and mounting of devices or fixtures. Boxes for metallic raceways, 101.6 by 101.6 mm (4 by 4 inch) nominal size and smaller, shall be of the cast-metal hub type when located in normally wet locations, when flush and surface mounted on outside of exterior surfaces. Large size boxes shall be NEMA 4 or as shown. Boxes in other locations shall be sheet steel except that aluminum boxes may be used with aluminum conduit, when permitted by NFPA 70. In partitions of light steel construction bar hangers with 25 mm long studs, mounted between metal wall studs or metal stud "C" brackets snapped on and tab-locked to metal wall studs, shall be used to secure boxes to the building structure. When "C" brackets are used, additional box support shall be provided on the side of the box opposite the brackets. The edges of boxes for electrical devices shall be flush with the finished surfaces in gypsum and plasterboard installations. Boxes for mounting lighting fixtures shall be not less than 101.6 mm square except smaller boxes may be installed as required by fixture configuration, as approved. Boxes installed for concealed wiring shall be provided with suitable extension rings or plaster covers, as required. The bottom of boxes installed in masonry-block walls for concealed wiring shall be flush with the top of a block to minimize cutting of blocks, and boxes shall be located horizontally to avoid cutting webs of block. Indicated elevations are approximate. Unless otherwise indicated, boxes for wall switches shall be mounted 1.2 meters above finished floors. Switch and outlet boxes on opposite sides of fire rated walls shall be separated by a minimum horizontal distance of 600 mm. Cast-metal boxes installed in wet locations and boxes installed flush with the outside of exterior surfaces shall be gasketed. Separate boxes shall be provided for flush or recessed fixtures when required by the fixture

terminal operating temperature, and fixtures shall be readily removable for access to the boxes unless ceiling access panels are provided. Boxes and supports shall be fastened to wood with wood screws or screw-type nails of equal holding strength, with bolts and metal expansion shields on concrete or brick, with toggle bolts on hollow masonry units, and with machine screws or welded studs on steel work. Threaded studs driven in by powder charge and provided with lockwashers and nuts, or nail-type nylon anchors may be used in lieu of expansion shields, or machine screws. In open overhead spaces, cast-metal boxes threaded to raceways need not be separately supported except where used for fixture support; cast-metal boxes having threadless connectors and sheet metal boxes shall be supported directly from the building structure or by bar hangers. Hangers shall not be fastened to or supported from joist bridging. Cast-metal boxes with 2.4 mm (3/32 inch) wall thickness are acceptable. Where bar hangers are used, the bar shall be attached to raceways on opposite sides of the box and the raceway shall be supported with an approved type fastener not more than 600 mm from the box. Penetration of more than 38.1 mm (1-1/2 inches) into reinforced-concrete beams or more than 19.1 mm (3/4 inch) into reinforced-concrete joists shall avoid cutting any main reinforcing steel.

3.5.1 Boxes for Use with Raceway Systems

Boxes for use with raceway systems shall be not less than 38.1 mm (1-1/2 inches) deep except where shallower boxes required by structural conditions are approved. Sheetmetal boxes for other than lighting fixtures shall be not less than 101.6 mm (4 inches) square except that 101.6 by 50.8 mm (4 by 2 inch) boxes may be used where only one raceway enters the outlet. Contractor shall size the telephone outlet boxes as required by the number, size and type of outlets specified and as required by the outlets furnished by the Contractor.

3.5.2 Boxes for Use with Cable Systems

Boxes for use with cable systems shall be not less than 76.2 by 50.8 mm (3 by 2 inch) sectional boxes, 50.8 mm (2 inches) deep.

3.5.3 Pull Boxes

Pull boxes of not less than the minimum size required by NFPA 70 shall be constructed of aluminum or galvanized sheet steel, except where cast-metal boxes are required in locations specified above. Boxes shall be furnished with screw-fastened covers. Where several feeders pass through a common pull box, the feeders shall be tagged to indicate clearly the electrical characteristics, circuit number, and panel designation.

3.5.4 Conduit Stub-Ups

Conduits stubbed up through concrete floors for connections to freestanding equipment shall be provided with a short elbow and an adjustable top or coupling threaded inside for plugs, set flush with the finished floor. Wiring shall be extended in rigid threaded conduit to equipment, except that where required, flexible conduit may be used 150 mm (6 inches) above the floor. Screwdriver-operated threaded flush plugs shall be installed in conduits from which no equipment connections are made to suit the devices installed.

3.6 DEVICE PLATES

One-piece type device plates shall be provided for all outlets and

fittings. Plates on unfinished walls and on fittings shall be of zinc-coated sheet steel, cast-metal, or impact resistant plastic having rounded or beveled edges. Plates on finished walls shall be of steel with ivory satin finish corrosion resistant steel. Screws shall be of metal with countersunk heads, in a color to match the finish of the plate. Plates shall be installed with all four edges in continuous contact with finished wall surfaces without the use of mats or similar devices. Plaster fillings will not be permitted. Plates shall be installed with an alignment tolerance of 1.6 mm (1/16 inch). The use of sectional-type device plates will not be permitted. Plates installed in wet locations shall be gasketed and provided with a hinged, gasketed cover, unless otherwise specified.

3.7 RECEPTACLES

3.7.1 Single and Duplex

Single and duplex receptacles shall be rated 15 and/or 20 amperes, 125 volts, two-pole, three-wire, grounding type with polarized parallel slots as indicated on the drawings. Bodies shall be of brown or ivory to match color of switch handles in the same room or to harmonize with the color of the respective wall, and supported by mounting strap having plaster ears. Contact arrangement shall be such that contact is made on two sides of an inserted blade. Receptacle shall be side- or back-wired with two screws per terminal. The third grounding pole shall be connected to the metal mounting yoke. Switched receptacles shall be the same as other receptacles specified except that the ungrounded pole of each suitable receptacle shall be provided with a separate terminal. Only the top receptacle of a duplex receptacle shall be wired for switching application.

3.7.2 Wet Locations

Receptacles in wet locations must be installed in an assembly rated for such use whether the plug is inserted or withdrawn, unless otherwise indicated. In a duplex installation, the receptacle cover shall be configured to shield the connections whether one or both receptacles are in use.

3.7.3 Receptacles, 15-Ampere, 125-Volt

Receptacles, 15-ampere, 250-volt, shall be duplex two-pole, three-wire, NEMA 5-15R, grounding type with bodies of brown phenolic compound supported by mounting yoke having plaster ears. The third grounding pole shall be connected to the metal yoke.

3.7.4 Receptacles, 20-Ampere, 125-Volt

Receptacles, duplex, 20-ampere, 125-volt, NEMA 5-20R shall be molded plastic, two-pole, three-wire grounding type, complete with appropriate mating cord-grip plug.

3.7.5 Receptacles, Midget Twistlock, 15-Ampere, 125-Volt

Receptacles, single, 15-ampere, 125-volt, shall be molded-plastic, two-pole, three-wire type, NEMA ML-2R for winch complete with appropriate plug.

3.7.6 Receptacles, 100-Ampere, 480-Volt

Receptacles, single 100-ampere, 480-volt, shall be flush, molded plastic, five-pole, five-wire type.

3.7.7 Special-Purpose or Heavy-Duty Receptacles

Special-purpose or heavy-duty receptacles 20 A, 3 Ph-4 wire shall be of the type and of ratings and number of poles indicated. or required for the anticipated purpose. Contact surfaces may be either round or rectangular. One appropriate straight or angle-type plug shall be furnished with each receptacle. Locking of receptacles, indicated to be the locking type, shall be accomplished by the twist rotation of the plug. Receptacle shall be NEMA L19-20.

3.8 WALL SWITCHES

Wall switches shall be of the totally enclosed tumbler type. The wall switch handle and switch plate color shall harmonize with the color of the respective wall. Wiring terminals shall be of the screw type or of the solderless pressure type having suitable conductor-release arrangement. Not more than one switch shall be installed in a single-gang position. Switches shall be rated 20-ampere 277-volt for use on alternating current only. Pilot lights indicated shall consist of yoke-mounted candelabra-base sockets rated at 75 watts, 125 volts, and fitted with glass or plastic jewels. A clear 6-watt lamp shall be furnished and installed in each pilot switch. Jewels for use with switches controlling motors shall be green, and jewels for other purposes shall be red. Dimming switches shall be solid-state flush mounted, sized for the loads.

3.9 SERVICE EQUIPMENT

Service-disconnecting means shall be of the enclosed molded-case circuit breaker type as indicated with external handle for manual operation. When service disconnecting means is a part of an assembly, the assembly shall be listed as suitable for service entrance equipment. Enclosures shall be sheet metal with hinged cover for surface mounting unless otherwise indicated.

3.10 PANELBOARDS

Circuit breakers and switches used as a motor disconnecting means, and not in sight of the motor and the driven machinery location, shall be capable of being locked in the open position. Door locks shall be keyed alike. Nameplates shall be as approved. Directories shall be typed to indicate loads served by each circuit and mounted in a holder behind a clear protective covering. Busses shall be copper or aluminum.

3.10.1 Panelboards

Panelboards shall be circuit breaker type as indicated on the drawings. UL 98.

3.10.2 Circuit Breakers

Circuit breakers shall be stationary.

3.11 FUSES

Equipment provided under this contract shall be provided with a complete set of properly rated fuses when the equipment manufacturer utilize fuses

in the manufacture of the equipment, or if current-limiting fuses are required to be installed to limit the ampere-interrupting capacity of circuit breakers or equipment to less than the maximum available fault current at the location of the equipment to be installed. Fuses shall have a voltage rating of not less than the phase-to-phase circuit voltage, and shall have the time-current characteristics required for effective power system coordination.

3.11.1 Cartridge Fuses; Noncurrent-Limiting Type

Cartridge fuses of the noncurrent-limiting type shall be Class H, nonrenewable, dual element, time lag type and shall have interrupting capacity of 10,000 amperes. At 500 percent current, cartridge fuses shall not blow in less than 10 seconds. Cartridge fuses shall be used for circuits rated in excess of 30 amperes, 125 volts, except where current-limiting fuses are indicated.

3.11.2 Cartridge Fuses; Current-Limiting Type

Cartridge fuses, current-limiting type, Class RK1 and RK5 shall have tested interrupting capacity not less than 100,000 amperes. Fuse holders shall be the type that will reject all Class H fuses.

3.12 UNDERGROUND SERVICE

Unless otherwise indicated, interior conduit systems shall be stubbed out 1.5 m beyond the building wall and 600 mm below finished grade, for interface with the exterior service lateral conduits and exterior communications conduits. Outside conduit ends shall be bushed and capped, or plugged until connected to exterior conduit systems. Underground service lateral conductors will be extended to building service entrance and terminated in accordance with the requirements of Section 16375 ELECTRICAL DISTRIBUTION SYSTEM, UNDERGROUND and NFPA 70.

3.13 MOTORS

Motors shall be as specified in paragraph Motors, ac, Fractional and Integral Kilowatt, whether or not motors are separately provided or included in equipment assemblies specified in other sections of these specifications. Each motor shall conform to the kW (hp) and voltage ratings indicated, and shall have a service factor and other characteristics that are essential to the proper application and performance of the motors under conditions shown or specified. Three-phase motors for use on 3-phase 208-volt systems shall have a nameplate rating of 200 volts. Unless otherwise specified, all motors shall have open frames, and continuous-duty classification based on a 40 degree C ambient temperature reference. Polyphase motors shall be squirrel-cage type, having normal-starting-torque and low-starting-current characteristics, unless other characteristics are specified in other sections of these specifications or shown on contract drawings. The Contractor shall be responsible for selecting the actual kilowatt (horsepower) ratings and other motor requirements necessary for the applications indicated. When electrically driven equipment furnished under other sections of these specifications materially differs from the design, the Contractor shall make the necessary adjustments to the wiring, disconnect devices and branch-circuit protection to accommodate the equipment actually installed.

3.14 MOTOR CONTROL

Each motor or group of motors requiring a single control shall be provided under other sections of these specifications with a suitable controller and devices that will perform the functions as specified for the respective motors. Each motor of 93 W (1/8 hp) or larger shall be provided with thermal-overload protection. Polyphase motors shall have overload protection in each ungrounded conductor. The overload-protection device shall be provided either integral with the motor or controller, or shall be mounted in a separate enclosure. Unless otherwise specified, the protective device shall be of the manually reset type. Single or double pole tumbler switches specifically designed for alternating-current operation only may be used as manual controllers for single-phase motors having a current rating not in excess of 80 percent of the switch rating. Automatic control devices such as thermostats, float or pressure switches may control the starting and stopping of motors directly, provided the devices used are designed for that purpose and have an adequate kilowatt (horsepower) rating. When the automatic-control device does not have such a rating, a magnetic starter shall be used, with the automatic-control device actuating the pilot-control circuit. When combination manual and automatic control is specified and the automatic-control device operates the motor directly, a double-throw, three-position tumbler or rotary switch shall be provided for the manual control; when the automatic-control device actuates the pilot control circuit of a magnetic starter, the latter shall be provided with a three-position selector switch marked MANUAL-OFF-AUTOMATIC. Connections to the selector switch shall be such that only the normal automatic regulatory control devices will be bypassed when the switch is in the Manual position; all safety control devices, such as low- or high-pressure cutouts, high-temperature cutouts, and motor-overload protective devices, shall be connected in the motor-control circuit in both the Manual and the Automatic positions of the selector switch. Control circuit connections to any MANUAL-OFF-AUTOMATIC switch or to more than one automatic regulatory control device shall be made in accordance with wiring diagram approved by the Contracting Officer unless such diagram is included on the drawings. All controls shall be 120 volts or less unless otherwise indicated.

3.14.1 Contacts

Contacts in miscellaneous control devices such as float switches, pressure switches, and auxiliary relays shall have current and voltage ratings in accordance with NEMA ICS 2 for rating designation B 300.

3.14.2 Safety Controls

Safety controls for boilers shall be connected to a 2-wire, 120 volt grounded circuit supplied from the associated boiler-equipment circuit. Where the boiler circuit is more than 120 volts to ground, safety controls shall be energized through a two-winding transformer having its 120 volt secondary winding grounded. Overcurrent protection shall be provided in the ungrounded secondary conductor and shall be sized for the load encountered.

3.15 MOTOR-DISCONNECT MEANS

Each motor shall be provided with a disconnecting means when required by NFPA 70 even though not indicated. For single-phase motors, a single or double pole toggle switch, rated only for alternating current, will be acceptable for capacities less than 30 amperes, provided the ampere rating of the switch is at least 125 percent of the motor rating. Switches shall disconnect all ungrounded conductors.

3.16 TRANSFORMERS

Only single- and three-phase transformers having two windings per phase will be approved. Full-capacity standard NEMA taps shall be provided in the primary windings of transformers having a primary rating in excess of 600 volts. Three-phase transformers shall be connected only in a delta-wye or wye-delta configuration, as indicated. "T" connections may be used for transformers rated at 15 kVA or below. The insulation on transformer windings may be the manufacturer's standard for transformers rated for operation in a 40-degree Celsius ambient temperature unless a higher-temperature insulation is shown, specified or required by the application indicated. Single kVA ratings shown are based on self-cooled operation. The basic impulse level (BIL) of individual transformers shall be as stated in the following paragraphs. Transformers to be located within the building may be provided in the manufacturer's standard. The average sound level in decibels (dB) of transformers shall not exceed the following dB level for the applicable kVA rating range listed:

kVA RANGE	dB SOUND LEVEL
1-50	50
51-150	55
151-300	58

3.16.1 Conventional Dry-Type Transformers

Transformers having the primary or higher-voltage winding rated at 600 volts or less and a secondary or lower-voltage winding rated at 240 volts or less may be manufacturer's standard ventilated or enclosed, self-cooled type of transformer unless otherwise shown, specified or required for proper and safe application. Transformers shown with primary ratings in excess of 600 volts shall have the NEMA 220 degree C insulation and shall be rated for a temperature rise of 80 degrees C above ambient. Similarly, transformers having primary windings rated at 480 volts or less and a kVA rating of 150 or larger shall have Class H insulation and be suitable for an 80 degree C temperature rise above ambient. The percent voltage impedance for the transformer shown to supply all facility power demands shall be 5.75 as required to limit the available fault current to less than the ampere-interrupting-capacity of the equipment supplied through the power supply transformer shown. These distribution transformers shall have a basic impulse level (BIL) rating not less than the ANSI standard BIL rating for the mineral-oil insulated type of transformer having the same voltage classification or rating as the dry-type of transformer proposed for installation, not less than 95 kV for the distribution voltage shown to supply the facility power demands.

3.16.2 Epoxy-Resin-Cast, Dry-Type Transformers

The primary and secondary coils shall be completely enclosed by a suitable epoxy-resin mixture cast under vacuum to ensure a void-free casting that is fire and moisture resistant. Busses required for connection to adjacent items of equipment shall be similarly coated, insulated or painted to resist corrosion except at the point of connection of busses or cables. Connections shall be made corrosion-resistant by the Contractor following installation of the transformers at the project site. The transformers shall be designed and manufactured to operate in a 40 degree Celsius

temperature rise above the ambient temperature when provided in the manufacturer's standard ventilated enclosure. The percent voltage impedance of the transformer required to supply all facility power demands shall be 5.75 as required to limit the available fault current to less than the ampere-interrupting-capacity of the equipment supplied through the power supply transformer shown. These distribution transformers shall have a basic impulse level (BIL) rating not less than the ANSI standard BIL rating for the mineral-oil insulated type of transformer having the same voltage classification or rating as the transformer proposed for installation, not less than 95 kV for the distribution voltage shown to supply the facility power demands.

3.17 LAMPS AND LIGHTING FIXTURES

Ballasted fixtures shall have ballasts which are compatible with the specific type and rating of lamps indicated and shall comply with the applicable provisions of the publications referenced.

3.17.1 Lamps

Lamps of the type, wattage, and voltage rating indicated shall be delivered to the project in the original cartons and installed in the fixtures just prior to the completion of the project.

3.17.1.1 Incandescent

Incandescent lamps shall be for 125-volt operation unless otherwise indicated.

3.17.1.2 Fluorescent

Fluorescent lamps for electronic ballasts shall have standard cool-white color characteristics and shall be of a type that will not require starter switches. Lamps shall be of the rapid-start type unless otherwise shown or approved. Fluorescent lamps shall be compatible with electronic ballasts.

3.17.1.3 High-Intensity-Discharge

High-intensity-discharge lamps shall be the high-pressure sodium type unless otherwise indicated, shown, or approved.

3.17.2 Fixtures

Fixtures shall be as shown and shall conform to the following specifications and shall be as detailed on Standard Drawing No. 40-06-04, Sheet Nos. 31,44,56,60, and 65, which accompany and form a part of this specification for the types indicated. Illustrations shown on these sheets are indicative of the general type desired and are not intended to restrict selection to fixtures of any particular manufacturer. Fixtures of similar designs and equivalent energy efficiency, light distribution and brightness characteristics, and of equal finish and quality will be acceptable if approved. In suspended acoustical ceilings with fluorescent fixtures, the fluorescent emergency light fixtures shall be furnished with self-contained battery packs.

3.17.2.1 Accessories

Accessories such as straps, mounting plates, nipples, or brackets shall be provided for proper installation. Open type fluorescent fixtures with

exposed lamps shall have a wire-basket type guard.

3.17.2.2 Suspended Fixtures

Suspended fixtures shall be provided with swivel hangers in order to ensure a plumb installation. Pendants, rods, or chains 1.2 meters or longer excluding fixture, shall be braced to limit swinging. Bracing shall be 3 directional, 120 degrees apart. Single unit suspended fluorescent fixtures shall have twin-stem hangers. Multiple unit or continuous-row fluorescent units shall have a tubing or stem for wiring at one point, and a tubing or rod suspension provided for each length of chassis including one at each end. Maximum distance between adjacent tubing or stems shall be 3.1 meters. Rods shall be of not less than 4.8 mm (3/16 inch) diameter. Flexible raceway shall be installed to each fixture from an overhead junction box. Fixture to fixture wiring installation is allowed only when fixtures are installed end to end in a continuous run.

3.17.2.3 Ceiling Fixtures

Ceiling fixtures shall be coordinated with and suitable for installation in, on, or from the suspended ceiling provided under other sections of these specifications. Installation and support of fixtures shall be in accordance with the NFPA 70 and manufacturer's recommendations. Where seismic requirements are specified herein, fixtures shall be supported as shown or specified. Recessed fixtures shall have adjustable fittings to permit alignment with ceiling panels. Recessed fixtures installed in fire-resistive type of suspended ceiling construction shall have the same fire rating as the ceiling or shall be provided with fireproofing boxes having materials of the same fire rating as the ceiling panels, in conformance with UL-03. Surface-mounted fixtures shall be suitable for fastening to the structural support for ceiling panels.

3.17.2.4 Sockets

Sockets of industrial, strip, and other open type fluorescent fixtures shall be of the type requiring a forced movement along the longitudinal axis of the lamp for insertion and removal of the lamp.

3.17.2.5 Emergency Light Sets

Emergency light sets shall conform to UL 924 with the number of heads as indicated. Sets shall be permanently connected to the wiring system by conductors installed in short lengths of flexible conduit.

3.18 BATTERY CHARGERS

Battery chargers shall be installed in conformance with NFPA 70.

3.19 EQUIPMENT CONNECTIONS

All wiring not furnished and installed under other sections of the specifications for the connection of electrical equipment as indicated on the drawings shall be furnished and installed under this section of the specifications. Connections shall comply with the applicable requirements of paragraph WIRING METHODS. Flexible conduits 2 m or less in length shall be provided to all electrical equipment subject to periodic removal, vibration, or movement and for all motors. All motors shall be provided with separate grounding conductors. Liquid-tight conduits shall be used in damp or wet locations.

3.19.1 Motors and Motor Control

Control equipment furnished under this section of the specifications, and shown on the drawings, shall be connected under this section of the specifications unless shown or specified otherwise. Except as otherwise specifically noted, automatic-control wiring, signaling, and protective devices are not included in this section of the specifications, but shall be furnished and installed under other sections of the specifications. Control wiring not shown on the drawings shall be furnished under the other sections of the specifications.

3.19.2 Installation of Government-Furnished Equipment

Wiring shall be extended to the equipment, and proper connections made thereto.

3.20 TELEPHONE WIRING SYSTEM

The telephone wiring system shall be complete and functional.

3.20.1 Telephone Cables

Each telephone outlet will be serviced with 24-gauge solid copper station-type color coded cable, vinyl insulated with an overall vinyl jacket. Cable shall be continuous from each telephone outlet to backboard indicated on the drawings. Splicing of individual cables shall not be permitted. At each outlet, four-pair cable shall be terminated on the modular jack assembly, using color code provided by the Contracting Officer. At the backboard, terminate the cable on cross-connect terminal blocks and mark with the appropriate outlet number.

3.20.2 Telephone Outlets

Modular telephone outlets shall comply with FCC Rules and Regulations, Part 68, Subpart F. Each modular outlet shall have two modular jacks. Each eight-position jack in the modular outlet shall contain screw terminals or approved quick connect terminals for each conductor in the cable. The flush mounted cover shall be ivory. Each outlet shall be numbered for easy identification of type and location. The telephone outlet shall consist of multiple gang outlet box, device cover, satin finished steel or brushed aluminum cover plate with beveled edges and rubber grommet.

3.20.3 Crossconnect Blocks

Punch down 66 type connecting blocks shall be provided to terminate all subscriber lines. The blocks shall be attached to right side of the plywood telephone backboard in vertical rows.

3.20.4 Telephone Backboards

Telephone backboards shall be installed at locations shown on the drawings. The backboards shall be 18 mm (3/4 inch) plywood having a two-coat insulating varnish finish and shall be sized as shown on the drawings.

3.20.5 Building Entry Protection Modules

Building Entry Protection Modules shall be provided to terminate the building feeder cable. The modules shall be attached to the left side of

the telephone backboard.

3.20.6 Auxiliary Devices

All auxiliary devices such as tie bars, cable rings, etc. which are not shown but are required for a high grade installation shall be provided.

3.20.7 Qualifications of Installer

The system shall be installed by an experienced installer regularly engaged in the installation of telephone systems. The Contracting Officer may reject any proposed installer who can not show evidence of such qualifications.

3.21 PAINTING AND FINISHING

Field-applied paint on exposed surfaces shall be provided under Section 09900 PAINTING, GENERAL.

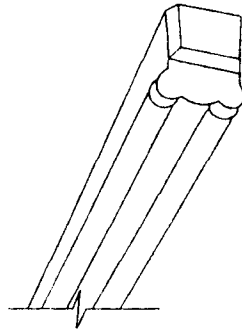
3.22 TESTS

After the interior-wiring-system installation is completed, and at such time as the Contracting Officer may direct, the Contractor shall conduct an operating test for approval. The equipment shall be demonstrated to operate in accordance with the requirements of this specification. Continuity test shall be conducted on the telephone wiring system. The test shall be performed in the presence of the Contracting Officer. The Contractor shall furnish all instruments and personnel required for the tests, and the Government will furnish the necessary electric power. No part of the electrical distribution system shall be energized prior to the resistance testing of that system's ground rods and submission of test results to the Contracting Officer. Test reports shall indicate the location of the rod and the resistance and the soil conditions at the time the test was performed.

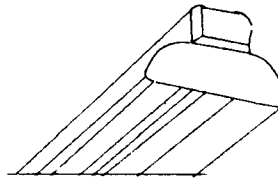
3.23 ONE-LINE DIAGRAM

A one-line diagram with main transformer, building disconnect means, and feeder breakers/switches to building panels located at the building disconnect shall be provided. Diagram shall be mounted under glass or shall be plastic laminated. The breaker/switch identification on the diagram shall match nameplate on the installed equipment.

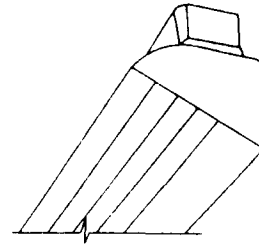
-- End of Section --



TYPE 220
Without
Reflector



TYPE 221
With Symmetric
Reflector



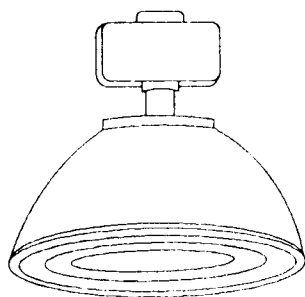
TYPE 222
With Asymmetric
Reflector

Single- and Two-Lamp Fluorescent Strip Fixture

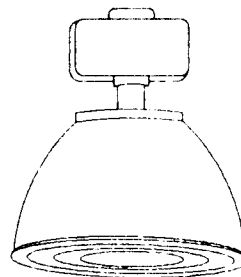
Suffix	Description
A	One lamp
B	Two lamps

Fixture shall be constructed of cold-rolled steel and shall conform to UL 1570. The fixture shall have a die-formed steel channel, suitable mounting holes, and 1/2-inch knockouts in back. Channel and end fittings shall have a baked white enamel finish. The channel and end fittings shall be removed to permit the installation of a continuous row of fixtures, the closure of fixtures at the ends of continuous rows, and the closure of the ends of individually mounted fixtures with no light leakage. Channel covers shall have threaded fittings for reflector mounting, shall be constructed of die-formed steel, and shall be finished with baked white enamel. All ferrous metal parts shall receive a rust inhibitive coating before application of finish coat. Reflectors shall be designed for direct attachment to the channel cover with suitable threaded fittings. Reflectors shall be manufacturer's standard commercial product and shall be constructed of die-formed aluminum with highly polished finish, or steel with white porcelain enamel finish, or steel with baked white enamel finish. Fixture shall be suitable for pendant and surface mounting. Standard ballast(s) shall be the Class P, high power factor type which has been approved for the application by the Certified Ballast Manufacturers. Fixture shall be prewired. Sockets shall be of the type requiring a forced movement along the longitudinal axis of the lamp for insertion and removal of the lamp. Fluorescent tubes shall be protected by a virgin acrylic protective sleeve and clear plastic vented end caps.

Fixture types indicated on this sheet shall also conform to requirements specified and indicated in the contract documents.



TYPE 301
High Bay



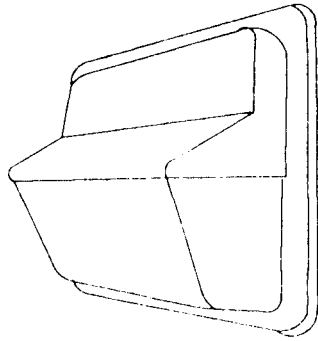
TYPE 302
Low Bay

Enclosed, Pendant, Integrally Ballasted, Industrial,
High Intensity Discharge Fixture

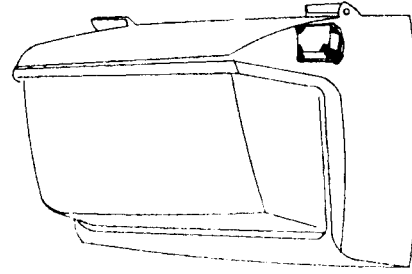
First Suffix	Second Suffix	Description
A		Rated for metal halide lamp
B		Rated for high pressure sodium lamp
	1	Type 300 emergency quartz standby

Fixture shall conform to UL 1572. The ballast housing and structural parts, including the mounting devices, shall be of cast aluminum. The optical assembly shall be enclosed, gasketed, and locked to the ballast housing by a positive vibration-proof means. An optical assembly filter to permit the passage of air during heating and cooling cycles shall be provided. All exposed cast aluminum parts shall have a baked enamel paint finish. The lens shall be heat and impact resistant glass mounted in a gasketed, hinged aluminum door frame. Ballast shall be of the high power factor type. Fixture shall be prewired. Ballast shall start and operate the lamp in an ambient temperature range of minus 20 degrees F to 105 degrees F. Metal halide fixture shall use a lead-peaked autotransformer ballast. High pressure sodium fixture shall use a regulated type ballast. Reflector shall be constructed of aluminum and contoured or formed to provide high lighting efficiency. The exterior of the reflector shall have a clear acrylic lacquer protective coating. The interior of the reflector shall be the manufacturer's standard commercial product finish suitable for light source provided. The fixture shall have a mogul base glazed porcelain lampholder, adjustable for varying the spacing-to-mounting-height ratio in the field. The fixture shall have separate, removable mounting components that can be easily removed and assembled to the structural or mounting hardware before mounting the remainder of the fixture.

Fixture types indicated on this sheet shall also conform to requirements specified and indicated in the contract documents.



TYPE 501



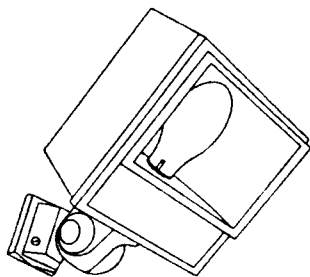
TYPE 502

High Intensity Discharge Fixture for Exterior Wall Mounting,
Medium Output

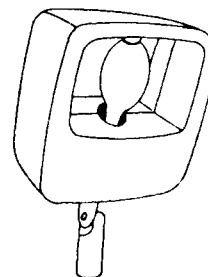
Suffix	Description
	Rated for:
A	50 watt high pressure sodium lamp
B	70 watt high pressure sodium lamp
C	100 watt high pressure sodium lamp
D	150 watt high pressure sodium lamp
E	175 watt metal halide lamp

Fixture shall conform to UL 1572 and shall be rated for use in wet locations. The fixture housing, door assembly, and backplate shall be die-cast aluminum. The door assembly shall have integral cast aluminum hinges. The door assembly shall be held securely to the fixture housing with a stainless steel safety strap when the door is in the open position. The door assembly shall be held firmly against a sealing gasket between the fixture door and housing by stainless steel latches or with stainless steel or brass captive screws when the fixture door is closed. The refractor shall be prismatic borosilicate glass or polycarbonate resin. The refractor shall be gasketed and securely held in the door frame, but shall be easily removed for replacement with a common tool. The reflector shall be aluminum with the manufacturer's standard commercial product finish suitable for the type and rating of the lamp. The fixture shall have manufacturers standard protective coating. Cast knockouts shall be provided in the backplate for recessed outlet box mounting. Ballast shall be of the high power factor type. Ballast shall be of the lead-peak autotransformer type metal halide for lamps and the regulating type for high pressure sodium lamps. Ballast shall be capable of starting and operating the lamp at ambient temperatures from minus 20 degrees F to 105 degrees F. The fixture shall be prewired, and shall have a field adjustable, mogul base glazed porcelain lampholder.

Fixture types indicated on this sheet shall also conform to requirements specified and indicated in the contract documents.



TYPE 506
Wall Bracket Mounting



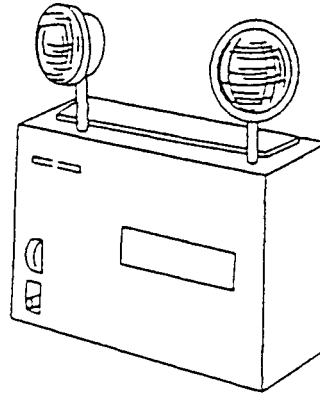
TYPE 507
Slip Fitter Mounting

High Intensity Discharge Floodlight with Asymmetrical Light Distribution

First Suffix	Second Suffix	Third Suffix	Description
A			Rated for metal halide lamp
B			Rated for high pressure sodium (HPS) lamp
	1		NEMA type 6 x 5 light distribution
	2		NEMA type 7 x 7 light distribution
	3		NEMA type 7 x 6 light distribution
		A	Fixture with instant restrike feature
		B	Type 300 emergency unit

Fixture shall conform to UL 1572 and NEMA FA 1, and shall be the heavy-duty, enclosed type. Fixture shall consist of a cast aluminum housing and a cast aluminum door assembly and shall be integrally ballasted unless otherwise shown or approved. The door assembly shall be hinged and gasketed and held in a closed position with screws of finish to match fixture or recessed stainless steel latches. The lens shall be thermal shock and impact resistant tempered glass and shall be held securely in the door frame. Reflector shall be aluminum with manufacturer's standard commercial product finish suitable for light source provided. All metallic parts of the fixture shall receive one or more rust-inhibitive coatings prior to the application of interior and exterior finishes in accordance with the standard practice of the manufacturer for commercially available exterior lighting fixtures. Ballast shall be of the high power factor type capable of starting and operating the lamp in an ambient temperature of minus 20 degrees F to 105 degrees F. Ballast shall be of the lead-peak autotransformer type for metal halide lamps and the regulating type for high pressure sodium lamps. If an instant restrike feature is specified, the fixture shall be equipped to permit restarting of the lamp to full lumen output within 5 seconds following restoration of power after each momentary power interruption. The fixture shall be prewired and shall include a mogul base glazed porcelain lampholder. Mounting hardware for the fixture shall be adjustable, and shall be the cast aluminum type unless otherwise approved.

Fixture types indicated on this sheet shall also conform to requirements specified and indicated in the contract documents.



TYPE 603

6-Volt Emergency Battery Pack Unit with Two Floodlights

Unit shall conform to UL 924, NFPA 101, and shall meet or exceed the NFPA 70 time and voltage requirements. The unit shall be dual-rated for use on either 120-Volt or 277-Volt alternating current power supplies. Following sustained loss of the normal power supply, the unit shall be capable of automatically and instantaneously illuminating the two 6-Volt lighting fixtures for a period of not less than 90 minutes at a battery voltage in excess of 87.5 percent of the nominal voltage rating. The battery shall be the nickel-cadmium, pocket plate type designed to be maintenance free during the expected battery life, and shall be warranted for not less than 3 years from the date of the purchase of the unit, and shall be field replaceable without requiring removal of other components. The battery charger shall be the solid-state type and shall provide a continuous, variable, current limited, filtered and regulated charge rate. The battery and charger shall be contained in a steel cabinet not less than 18 gauge thickness with an enamel finish, unless otherwise approved, which shall be equipped with a push-to-test switch and a meter to indicate battery voltage when the switch is closed. Mounting brackets or shelf shall be provided, complete with all mounting hardware, all with a finish to match the finish or color of the cabinet. The unit shall be prewired and equipped with two 6-volt, 5-8 watt floodlights as indicated.

Fixture type indicated on this sheet shall also conform to requirements specified and indicated in the contract documents.

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-- End of Section Table of Contents --

SECTION 16670

LIGHTNING PROTECTION SYSTEM

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI C135.30	(1988) Zinc-Coated Ferrous Ground Rods for Overhead or Underground Line Construction
--------------	--------------------------------------------------------------------------------------

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(1996) National Electrical Code
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NFPA 780	(1992) Lightning Protection Code
----------	----------------------------------

UNDERWRITERS LABORATORIES (UL)

UL-03	(1992) Electrical Construction Materials Directory
-------	----------------------------------------------------

UL 96	(1985; Rev thru Dec 1988) Lightning Protection Components
-------	-----------------------------------------------------------

UL 96A	(1982; Rev thru Jul 1990) Installation Requirements for Lightning Protection Systems
--------	--------------------------------------------------------------------------------------

UL 467	(1984; Rev thru Nov 1986) Grounding and Bonding Equipment
--------	-----------------------------------------------------------

UL 486A	(1991; R Oct 91) Wire Connectors and Soldering Lugs for Use with Copper Conductors
---------	------------------------------------------------------------------------------------

1.2 GENERAL REQUIREMENTS

1.2.1 Verification of Dimensions

The Contractor shall become familiar with all details of the work, verify all dimensions in the field, and shall advise the Contracting Officer of any discrepancy before performing the work. No departures shall be made without the prior approval of the Contracting Officer.

1.2.2 System Requirements

The system furnished under this specification shall consist of the standard products of a manufacturer regularly engaged in the production of lightning protection systems and shall be the manufacturer's latest UL approved design. The lightning protection system shall conform to NFPA 70 and NFPA 780, UL 96 and UL 96A, except where requirements in excess thereof are specified herein. Lightning Protection System shall incorporate the 30.48

m (100 ft) radius rolling ball concept for the zone of protection.

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL PROCEDURES:

SD-04 Drawings

Lightning Protection System; FIO.

Detail drawings consisting of a complete list of material, including manufacturer's descriptive and technical literature, catalog cuts, drawings, and installation instructions. Detail drawings shall demonstrate that the system has been coordinated and will function as a unit. Drawings shall show proposed layout and mounting and relationship to other parts of the work.

SD-13 Certificates

Materials and Equipment; FIO.

Where material or equipment is specified to comply with requirements of UL, proof of such compliance. The label of or listing in UL-03 will be acceptable evidence. In lieu of the label or listing, a written certificate from an approved nationally recognized testing organization equipped to perform such services, stating that the items have been tested and conform to the requirements and testing methods of Underwriters Laboratories may be submitted.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 General Requirements

No combination of materials shall be used that form an electrolytic couple of such nature that corrosion is accelerated in the presence of moisture unless moisture is permanently excluded from the junction of such metals. Where unusual conditions exist which would cause corrosion of conductors, conductors with protective coatings or oversize conductors shall be used. Where a mechanical hazard is involved, the conductor size shall be increased to compensate for the hazard or the conductors shall be protected by covering them with molding or tubing made of wood or nonmagnetic material. When metallic conduit or tubing is used, the conductor shall be electrically connected at the upper and lower ends.

2.1.2 Main and Secondary Conductors

Conductors shall be in accordance with NFPA 780 and UL 96 for Class I or Class II modified materials as applicable.

2.1.2.1 Copper

Copper conductors used on nonmetallic stacks shall weigh not less than 170 kg per 300 m (375 pounds per thousand feet), and the size of any wire in the cable shall be not less than No. 15 AWG. The thickness of any web or

ribbon used on stacks shall be not less than No. 12 AWG. Counterpoise shall be copper conductors not smaller than No. 4/0 AWG.

2.1.3 Ground Rods

Rods made of copper-clad steel shall conform to UL 467. Ground rods shall be not less than 19.1 mm diameter and 3.048 m in length.

2.1.4 Clamp-Type Connectors

Connectors for splicing conductors shall conform to UL 96, class as applicable, and UL 486A, Class 2, style and size as required for the installation.

2.1.5 Lightning Protection Components

Lightning protection components, such as bonding plates, air terminal supports, clips, and fasteners shall conform to UL 96, classes as applicable.

PART 3 EXECUTION

3.1 INTEGRAL SYSTEM

3.1.1 General Requirements

The lightning protection system shall consist of air terminals, roof conductors, down conductors, ground connections, and grounds, electrically interconnected to form the shortest distance to ground. All conductors on the structures shall be exposed except where conductors are in protective sleeves exposed on the outside walls. Secondary conductors shall interconnect with grounded metallic parts within the building. Interconnections made within side-flash distances shall be at or above the level of the grounded metallic parts.

3.1.1.1 Air Terminals

Air terminal design and support shall be in accordance with NFPA 780. Terminals shall be rigidly connected to, and made electrically continuous with, roof conductors by means of pressure connectors or crimped joints of T-shaped malleable metal and connected to the air terminal by a dowel or threaded fitting. Air terminals at the ends of the structure shall be set not more than 600 mm (2 feet) from the ends of the ridge or edges and corners of roofs. Spacing of air terminals 600 mm (2 feet) in height on ridges, parapets, and around the perimeter of buildings with flat roofs shall not exceed 6.1 meters. In specific instances where it is necessary to exceed this spacing, the specified height of air terminals shall be increased to meet the 30.48 meters (100 feet) radius rolling sphere zone of protection as described in NFPA 780. On large, flat or gently sloping roofs, as defined in NFPA 780, air terminals shall be placed at points of the intersection of imaginary lines dividing the surface into rectangles having sides not exceeding 15 m in length. Air terminals shall be secured against overturning either by attachment to the object to be protected or by means of a substantial tripod or other braces permanently and rigidly attached to the building or structure. Metal projections and metal parts of buildings, smokestacks, and other metal objects that do not contain hazardous materials and that may be struck but not appreciably damaged by lightning, need not be provided with air terminals. However, these metal objects shall be bonded to the lightning conductor through a metal

conductor of the same unit weight per length as the main conductor. Where metal ventilators are installed, air terminals shall be mounted thereon, where practicable. Any air terminal erected by necessity adjacent to a metal ventilator shall be bonded to the ventilator near the top and bottom thereof. Where nonmetallic spires, steeples, or ventilators are present, air terminals shall be mounted thereon or to the side. In addition, where spires or steeples project more than 3.0 m above the building, the conductor between the air terminal shall be continued to the nearest down conductor and securely connected thereto.

3.1.1.2 Roof Conductors

Roof conductors shall be connected directly to the roof or ridge roll. Sharp bends or turns in conductors shall be avoided. Necessary turns shall have a radius of not less than 200 mm. Conductors shall preserve a downward or horizontal course and shall be rigidly fastened every 900 mm along the roof and down the building to ground. Metal ventilators shall be rigidly connected to the roof conductor at three places. All connections shall be electrically continuous. Roof conductors shall be coursed along the contours of flat roofs, ridges, parapets, and edges; and where necessary, over flat surfaces, in such a way as to join each air terminal to all the rest. Roof conductors surrounding tank tops, decks, flat surfaces, and flat roofs shall be connected to form a closed loop.

3.1.1.3 Down Conductors

Down conductors shall be electrically continuous from air terminals and roof conductors to grounding electrodes. Down conductors shall be coursed over extreme outer portions of the building, such as corners, with consideration given to the location of ground connections and air terminals. Each building or structure shall have not less than two down conductors located as widely separated as practicable, at diagonally opposite corners. On rectangular structures having gable, hip, or gambrel roofs more than 35 m long, there shall be at least one additional down conductor for each additional 15 m of length or fraction thereof. On rectangular structures having French, flat, or sawtooth roofs exceeding 75 m in perimeter, there shall be at least one additional down conductor for each 30 m of perimeter or fraction thereof. On an L- or T-shaped structure, there shall be at least one additional down conductor; on an H-shaped structure, at least two additional down conductors; and on a wing-built structure, at least one additional down conductor for each wing. On irregularly shaped structures, the total number of down conductors shall be sufficient to make the average distance between them along the perimeter not greater than 30 meters. On structures exceeding 15 m in height, there shall be at least one additional down conductor for each additional 18 m of height or fraction thereof, except that this application will not cause down conductors to be placed about the perimeter of the structure at intervals of less than 15 meters. Additional down conductors shall be installed when necessary to avoid "dead ends" or branch conductors ending at air terminals, except where the air terminal is on a roof below the main protected level and the "dead end" or branch conductor is less than 5 m in length and maintains a horizontal or downward coursing. Down conductors shall be equally and symmetrically spaced about the perimeter of the structure. Down conductors shall be protected where necessary, to prevent mechanical injury to the conductor.

3.1.1.4 Interconnection of Metallic Parts

Metal doors, windows, and gutters shall be connected directly to the

grounds or down conductors using not smaller than No. 6 copper conductor, or equivalent. Conductors placed where there is probability of unusual wear, mechanical injury, or corrosion shall be of greater electrical capacity than would normally be used, or shall be protected. The ground connection to metal doors and windows shall be by means of mechanical ties under pressure, or equivalent.

3.1.1.5 Ground Connections

Ground connections comprising continuations of down conductors from the structure to the grounding electrode shall securely connect the down conductor and ground in a manner to ensure electrical continuity between the two. All connections shall be of the clamp type. There shall be a ground connection for each down conductor. Metal water pipes and other large underground metallic objects shall be bonded together with all grounding mediums. Ground connections shall be protected from mechanical injury. In making ground connections, advantage shall be taken of all permanently moist places where practicable, although such places shall be avoided if the area is wet with waste water that contains chemical substances, especially those corrosive to metal.

3.1.1.6 Grounding Electrodes

A grounding electrode shall be provided for each down conductor located as shown. A driven ground shall extend into the earth for a distance of not less than 3.0 meters. Ground rods shall be set not less than 900 mm, nor more than 2.5 m, from the structures foundation. The complete installation shall have a total resistance to ground of not more than 10 ohms. Ground rods shall be tested individually prior to connection to the system and the system as a whole shall be tested not less than 48 hours after rainfall. When the resistance of the complete installation exceeds the specified value or two ground rods individually exceed 10 ohms, the Contracting Officer will be notified immediately. A counterpoise, where required, shall be of No. 4/0 copper cable or equivalent material having suitable resistance to corrosion and shall be laid around the perimeter of the structure in a trench not less than 600 mm deep at a distance not less than 900 mm nor more than 2.5 m from the nearest point of the structure. All connections between ground connectors and grounds or counterpoise, and between counterpoise and grounds shall be electrically continuous. Where so indicated on the drawings, an alternate method for grounding electrodes in shallow soil shall be provided by digging trenches radially from the building. The lower ends of the down conductors or their equivalent in the form of metal strips or wires are then buried in the trenches.

3.1.2 Igloo-Type Magazines

In earth-covered reinforced-concrete, igloo-type magazines, the reinforcing steel shall be made electrically continuous. Electrical continuity may be provided by clipping or brazing, unless a specific method is noted on the drawings. The air terminals and roof conductors shall be securely connected to, and made electrically continuous with, the reinforcing steel. Air terminals shall be located on the top of the front wall, roof, and one on the ventilators in the rear. The air terminals shall extend vertically at least 600 mm above the top of the front wall and the highest point on the ventilator. Down conductors and grounding electrodes shall be provided at diagonally opposite corners of the magazine and shall be connected together. Grounding electrodes shall be connected to the horizontal reinforcing rods below the floor line of the wall system. The steel door

frame shall be made electrically continuous with the reinforcing steel. The steel door shall be connected to the steel frame by means of a flexible copper strap or cable unless the steel hinges make the door and frame electrically continuous.

3.1.3 Post Tensioning Systems

On construction utilizing post tensioning systems to secure precast concrete sections, the post tension rods shall not be used as a path for lightning to ground. Down conductors shall be provided on structures using post tensioning systems; down conductors shall have sufficient separation from post tension rods to prevent side-flashing. Post tension rods shall be bonded to the lightning protection and grounding systems only at the base of the structure; this bonding shall be performed in strict accordance with the recommendations of the post tension rod manufacturer, and shall be done by, or in the presence of, a representative of the manufacturer.

3.2 INTERCONNECTION OF METAL BODIES

Metal bodies of conductance shall be protected if not within the zone of protection of an air terminal. All metal bodies of conductance having an area of 0.258 square meters (400 square inches) or greater or a volume of 0.0164 cubic meters (1000 cubic inches) or greater shall be bonded to the lightning protection system using main size conductors and a bonding plate having a surface contact area of not less than 1935.5 square millimeters (3 square inches). Provisions shall be made to guard against the corrosive effect of bonding dissimilar metals. Metal bodies of inductance shall be bonded at their closest point to the lightning protection system using secondary bonding conductors and fittings. A metal body that exceeds 1.5 m in any dimension, that is situated wholly within a building, and that does not at any point come within 1.8 m of a lightning conductor or metal connected thereto shall be independently grounded.

3.3 INSPECTION

The lightning protection system will be inspected by the Contracting Officer to determine conformance with the requirements of this specification. No part of the system shall be concealed until so authorized by the Contracting Officer.

-- End of Section --

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-- End of Section Table of Contents --

SECTION 16721

FIRE DETECTION AND ALARM SYSTEM

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI C135.30 (1988) Zinc-Coated Ferrous Ground Rods for Overhead or Underground Line Construction

FACTORY MUTUAL ENGINEERING AND RESEARCH (FM)

FM P7825 (1994; Supple 1) Approval Guide

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C62.41 (1991) Surge Voltages in Low-Voltage AC Power Circuits

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (1996) National Electrical Code

NFPA 72 (1993) National Fire Alarm Code

NFPA 90A (1993) Installation of Air Conditioning and Ventilating Systems

UNDERWRITERS LABORATORIES (UL)

UL-04 (1994) Fire Protection Equipment Directory

UL 6 (1993) Rigid Metal Conduit

UL 38 (1994; Rev Jan 1994) Manually Actuated Signaling Boxes for Use with Fire-Protective Signaling Systems

UL 228 (1993) Door Closers-Holders, with or without Integral Smoke Detectors

UL 268 (1989; Rev May 1989) Smoke Detectors for Fire Protective Signaling Systems

UL 464 (1990) Audible Signal Appliances

UL 467 (1993) Grounding and Bonding Equipment

UL 521 (1993) Heat Detectors for Fire Protective Signaling Systems

UL 797 (1993) Electrical Metallic Tubing

UL 864	(1991; Rev thru May 1994) Control Units for Fire-Protective Signaling Systems
UL 1242	(1983; Rev thru Jul 1993) Intermediate Metal Conduit

1.2 GENERAL REQUIREMENTS

1.2.1 Standard Products

Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of the products and shall be items that have been in satisfactory use for at least 2 years prior to bid opening. Equipment shall be supported by a service organization that can provide service within 24 hours.

1.2.2 Nameplates

Major components of equipment shall have the manufacturer's name, address, type or style, voltage and current rating, and catalog number on a noncorrosive and nonheat-sensitive plate which is securely attached to the equipment.

1.2.3 Keys and Locks

Locks shall be keyed alike.

1.2.4 Tags

Tags with stamped identification number shall be furnished for keys and locks.

1.2.5 Verification of Dimensions

The Contractor shall become familiar with all details of the work, verify all dimensions in the field, and shall advise the Contracting Officer of any discrepancy before performing the work.

1.2.6 Compliance

The fire detection and internal alarm system and the central reporting system shall be configured in accordance with NFPA 72. The equipment furnished shall be compatible and be UL listed or FM approved or approved or listed by a nationally recognized testing laboratory in accordance with the applicable NFPA standards.

1.2.7 Manufacturer's Services

Services of a manufacturer's representative who is experienced in the installation, adjustment, testing, and operation of the equipment specified shall be provided. The representative shall supervise the installation, adjustment and testing of the equipment.

1.3 SYSTEM DESIGN

1.3.1 Operation

The fire alarm and detection system shall be a complete, supervised fire

alarm system. The system shall be activated into the alarm mode by actuation of any alarm initiating device. The system shall remain in the alarm mode until initiating device is reset and the fire alarm control panel is reset and restored to normal. Alarm initiating devices shall be connected to initiating device circuits (IDC), Style D, in accordance with NFPA 72. Alarm indicating appliances shall be connected to notification appliance circuits (NAC), Style Z in accordance with NFPA 72. A two-loop conduit system shall be provided so that if any one conduit and all conductors contained in that conduit are severed all IDC, or NAC, on that circuit shall remain functional. All textual, audible and visual appliances and systems shall comply with NFPA 72.

1.3.2 Operational Features

The system shall have the following operating features:

- a. Electrical supervision of alarm IDC, and NAC. Smoke detectors shall have combined alarm initiating and power circuits.
- b. Electrical supervision of the primary power (ac) supply, battery voltage, placement of alarm zone module (card, PC board) within the control panel, and transmitter tripping circuit integrity.
- c. Trouble buzzer and trouble lamp (light emitting diode or neon light) to activate upon a single break, open, or ground fault condition which prevents the required normal operation of the system. The trouble signal shall also operate upon loss of primary power (ac) supply, low battery voltage, removal of alarm zone module (card, PC board), and disconnection of the circuit used for transmitting alarm signals off-premises. A trouble alarm silence switch shall be provided which will silence the trouble buzzer, but will not extinguish the trouble indicator lamp. After the system returns to normal operating conditions, an automatic trouble reset feature shall be provided.
- d. Transmitter disconnect switch to allow testing and maintenance of the system without activating the transmitter but shall provide a trouble signal when disconnected and a restoration signal when reconnected. One person test mode - Activating an initiating device in this mode will activate an alarm for a short period of time, then automatically reset the alarm, without activating the transmitter during the entire process.
- e. Evacuation alarm silencing switch or switches which, when activated, will silence alarm devices, but will not affect the zone indicating lamp nor the operation of the transmitter. This switch shall be over-ridden upon activation of a subsequent alarm from an unalarmed zone and the alarm devices will be activated.
- f. Electrical supervision of circuits used for supervisory signal services. Supervision shall detect any open, short, or ground.
- g. Confirmation or verification modules shall be used on smoke detection initiating circuits. The modules shall interrupt the transmission of an alarm signal to the system control panel for a factory set period. This interruption period shall be adjustable from 1 to 60 seconds and be factory set at 20 seconds. Immediately following the interruption period, a confirmation

period shall be in effect during which time an alarm signal if present will be sent immediately to the control panel. All fire alarm devices other than smoke detectors shall be prohibited on circuits controlled by confirmation or verification modules.

- h. Zones for alarm IDC shall be arranged as indicated on the contract drawings.

1.3.3 Alarm Functions

An alarm condition on a circuit shall automatically initiate the following functions:

- a. Transmission of a signal over the station radio fire reporting system. The signal shall be common for all zones.
- b. Visual indications of the alarmed zone on the fire alarm control panel annunciator.
- c. Continuous sounding of alarm notification appliances only in designated areas.
- d. Deactivation of the air handling units throughout the building.

1.3.4 Primary Power

Operating power shall be provided as required by paragraph Power Supply for the System. Transfer from normal to emergency power or restoration from emergency to normal power shall be fully automatic and not cause transmission of a false alarm. Loss of ac power shall not prevent transmission of a signal via the fire reporting system upon operation of any initiating circuit.

1.3.5 Battery Backup Power

Battery backup power shall be through use of rechargeable, sealed-type storage batteries and battery charger.

1.4 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL PROCEDURES:

SD-01 Data

Battery; FIO.

Substantiating battery calculations for supervisory and alarm power requirements. Ampere-hour requirements for each system component and each panel component, and the battery recharging period shall be included.

Voltage Drop; FIO.

Voltage drop calculations for signaling appliance circuits to indicate that sufficient voltage is available for proper appliance operation.

Spare Parts; FIO.

Spare parts data for each different item of material and equipment specified, not later than 2 months prior to the date of beneficial occupancy. Data shall include a complete list of parts and supplies with the current unit prices and source of supply and a list of the parts recommended by the manufacturer to be replaced after 1 year of service.

Qualifications; FIO.

Qualifications, with verification of experience and license number, of a Registered Professional Engineer with at least 4 years of current experience in the design of the fire protection and detection systems. This engineer must perform the various specification items required by this section to be performed by a registered Professional Engineer.

SD-04 Drawings

Fire Alarm Reporting System; FIO.

Detail drawings, signed by the Registered Professional Engineer, consisting of a complete list of equipment and material, including manufacturer's descriptive and technical literature, catalog cuts, and installation instructions. Note that the contract drawings show layouts based on typical detectors. The contractor shall check the layout based on the actual detectors to be installed and make any necessary revisions in the detail drawings. The detail drawings shall also contain complete wiring and schematic diagrams for the equipment furnished, equipment layout, and any other details required to demonstrate that the system has been coordinated and will properly function as a unit.

Detailed point-to-point wiring diagram, signed by the Registered Professional Engineer, showing all points of connection. Diagram shall include connections between system devices, appliances, control panels, supervised devices, and all equipment that is activated or controlled by the panel.

SD-06 Instructions

Fire Alarm Reporting System; FIO.

Six copies of operating instructions outlining step-by-step procedures required for system startup, operation, and shutdown. The instructions shall include the manufacturer's name, model number, service manual, parts list, and brief description of all equipment and their basic operating features. Six copies of maintenance instructions listing routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guide. The instructions shall include conduit layout, equipment layout and simplified wiring, and control diagrams of the system as installed. Instructions shall be approved prior to training.

Training; FIO.

Lesson plans and training data, in manual format, for the training courses.

SD-08 Statements

Test Procedures; FIO.

Detailed test procedures, signed by the Registered Professional Engineer,

for the fire detection and alarm system 6 days prior to performing system tests.

SD-09 Reports

Testing; FIO.

Test reports in booklet form showing all field tests performed to prove compliance with the specified performance criteria, upon completion and testing of the installed system. Each test report shall document all readings, test results and indicate the final position of controls.

SD-13 Certificates

Equipment; FIO.

Certified copies of current approvals or listings issued by UL, FM or other nationally recognized testing laboratory, showing compliance with specified NFPA standards.

Installer; FIO.

The Contractor shall provide documentation demonstrating that its fire detection and alarm system installer has been regularly engaged in the installation of fire detection and alarm systems meeting NFPA standards for a minimum of three years immediately preceding commencement of this contract. Such documentation shall specifically include proof of satisfactory performance on at least three projects similar to that required by these specifications, including the names and telephone numbers of using agency points of contact for each of these projects. Documentation shall indicate the type of each system installed and include a written certificate that each system has performed satisfactorily in the manner specified for a period of not less than 12 months following completion. All such data shall be submitted 30 days prior to commencement of installation for approval of the Contracting Officer. Listing of the installer under "Protective Signaling Services - Local, Auxiliary, Remote Station Proprietary (UUJS)" of UL-04 shall be accepted as equivalent proof of compliance with the foregoing experience requirements.

1.5 DELIVERY AND STORAGE

All equipment delivered and placed in storage shall be stored with protection from the weather, humidity and temperature variation, dirt and dust, and any other contaminants.

PART 2 PRODUCTS

2.1 CONTROL PANEL

Control Panel shall comply with all the applicable requirements of UL 864. Panel shall be modular, installed in a surfacemounted steel cabinet with hinged door and cylinder lock. Control panel shall be a clean, uncluttered, and orderly assembled panel containing all components and equipment required to provide the specified operating and supervisory functions of the system. The panel shall have prominent rigid plastic, phenolic or metal identification plates for all lamps, zones, controls, meters, fuses, and switches. Nameplates for fuses shall also include ampere rating. Separate alarm and trouble lamp shall be provided for each zone alarm located on exterior of cabinet door or be visible through the

cabinet door. Control panel switches shall be within the locked cabinet. A suitable means shall be provided for testing the control panel visual indicating devices (meters or lamps). Meters and lamps shall be plainly visible when the cabinet door is closed. Signals shall be provided to indicate by zone any alarm, supervisory or trouble condition on the system.

Each IDC initiating circuit shall be powered and supervised so that a signal on one zone does not prevent the receipt of signals from other zones. Loss of power, including any or all batteries, shall not require the reloading of a program. Upon restoration of power, startup shall be automatic, and shall not require any manual operation. The loss of primary power or the sequence of applying primary or emergency power shall not affect the transmission of alarm, supervisory or trouble signals.

2.1.1 Visual Annunciators

Visual annunciators shall be provided for each active zone and spare zone. Four spare zones shall be provided for a minimum of eight total zones. Each lamp shall provide specific identification of the zone by means of a permanently attached rigid plastic, phenolic or metal sign with either raised or engraved letters. Zone identification shall consist of word description of the zone.

2.1.2 Cabinets

Cabinets shall be provided with ample gutter space to allow proper clearance between the cabinet and live parts of the panel equipment. If more than one modular unit is required to form a control panel, the units shall be installed in a single cabinet large enough to accommodate all units. Cabinets shall be painted red similar to FED-STD 595 color, number 11105.

2.1.3 Circuit Connections

Circuit conductors entering or leaving the panel shall be connected to screw-type terminals with each terminal marked for identification.

2.2 STORAGE BATTERIES

Storage Batteries shall be provided and shall be the sealed, lead-calcium type requiring no additional water. The batteries shall have ample capacity, with primary power disconnected, to operate the fire alarm system for a period of 48 hours. Following this period of operation via batteries, the batteries shall have ample capacity to operate all components of the system, including all alarm signaling devices in the total alarm mode for a minimum period of 15 minutes. Batteries shall be sized to deliver 50 percent more ampere/hours based on a 48 hour discharged rate than required for the calculated capacities. Battery cabinet shall be a separate compartment within the control panel cabinet. Batteries in the control panel shall be located at the bottom of the panel. Battery shall be provided with overcurrent protection in accordance with NFPA 72.

2.3 BATTERY CHARGER

Battery charger shall be completely automatic, with high/low charging rate, capable of restoring the batteries from full discharge to full charge within 12 hours. A separate ammeter shall be provided for indicating rate of charge. A separate voltmeter shall be provided to indicate the state of the battery charge. A pilot light indicating when batteries are manually placed on a high rate of charge shall be provided as part of the unit

assembly if a high rate switch is provided. Charger shall be located in control panel or battery cabinet.

2.4 MANUAL FIRE ALARM STATIONS

Manual fire alarm stations shall conform to the applicable requirements of UL 38. Manual stations shall be connected into alarm-initiating circuits. Stations shall be installed on surface mounted outlet boxes. Stations shall be single action type. Stations shall be finished in red, with raised letter operating instructions of contrasting color. Stations requiring the breaking of glass or plastic panels for operation are not acceptable. Stations employing glass rods are not acceptable. The use of a key or wrench shall be required to reset the station. Gravity or mercury switches are not acceptable. Switches and contacts shall be rated for the voltage and current upon which they operate. Stations shall have a separate screw terminal for each conductor. Surface mounted boxes shall be painted the same color as the fire alarm manual stations.

2.5 FIRE DETECTING DEVICES

Fire detecting devices shall comply with the applicable requirements of NFPA 72, NFPA 90A, UL 268, and UL 521. The detectors shall be provided as indicated. Detector base shall have screw terminals for making connections. No solder connections will be allowed. Detectors shall be connected into alarm initiating circuits. Installed devices shall conform to the classification of the area.

2.5.1 Smoke Detectors

Detectors shall be designed for detection of abnormal smoke densities. Smoke detectors shall be photoelectric type. Detectors shall contain a visible indicator lamp that shows when the unit is in alarm condition. Detectors shall not be adversely affected by vibration or pressure. Detectors shall be the plug-in type in which the detector base contains terminals for making all wiring connections.

2.5.1.1 Photoelectric Detectors

Detectors shall operate on a light scattering concept using an LED light source. Failure of the LED shall not cause an alarm condition. Detectors shall be factory set for sensitivity and shall require no field adjustments of any kind. Detectors shall have an obscuration rating between 1.9 and 2.4 percent per foot when tested in accordance with UL 268.

2.5.1.2 Duct Detectors

Duct detectors are provided under Section 15950 Heating, Ventilation, and Air Conditioning HVAC Control Systems.

2.6 NOTIFICATION APPLIANCES

Audible appliances shall be heavy duty and conform to the applicable requirements of UL 464. Devices shall be connected into alarm indicating circuits and shall have a separate screw terminal for each conductor. Devices shall be painted red.

2.6.1 Alarm Horns

Horns shall be surface mounted, with the matching mounting back box

recessed, single grill and vibrating type suitable for use in an electrically supervised circuit. Horns shall produce a minimum sound rating of at least 85 dBA at 3.048 m (10 feet). Horns used in exterior locations shall be specifically listed or approved for outdoor use and be provided with metal housing and protective grills.

2.6.2 Visual Notification Appliances

Visual notification appliances shall have high intensity optic lens and flash tubes. Strobes shall flash at approximately 1 flash per second and a minimum of 1 candela (8,000 peak candle power). Strobe shall be surface mounted.

2.6.3 Combination Audible/Visual Notification Appliances

Combination audible/visual notification appliances shall provide the same requirements as individual units except they shall mount as a unit in standard backboxes. All units shall be factory assembled. Any other audible indicating appliance employed in the fire alarm systems shall be approved by the authority having jurisdiction.

2.7 FIRE DETECTION AND ALARM SYSTEM PERIPHERAL EQUIPMENT

2.7.1 Radio Transceiver

Monaco transceiver shall be BT2-4E (16 zones). Transceiver shall operate on a frequency of 138,925 MHz. Transceiver shall be provided with but not limited to antenna, weather head, lightning arrestor, power connections, conduit, wire, and other required materials. Interface equipment shall be provided between the fire alarm panel and the transceiver. Interface equipment shall be enclosed in a NEMA 1 rated box. Interface equipment shall enable transmission of all required fire alarm panel signals to the base fire alarm department. The antenna shall enable the transceiver to transmit to both Monaco D-500 central stations. Locate antenna to provide line-of-sight communication between transceiver and central station, or locate for best transceiver operation. Only Monaco manufacturer trained personnel shall supervise the installation of the transceiver and related equipment.

2.7.2 Conduit

Conduit and fittings shall comply with UL 6, UL 1242 and UL 797.

2.7.3 Wiring

Wiring for 120V ac power shall be No. 12 AWG minimum. Wiring for low voltage dc circuits shall be No. 16 AWG minimum. Power wiring (over 28 volts) and control wiring shall be isolated. All wiring shall conform to NFPA 70. System field wiring shall be solid copper and installed in metallic conduit or electrical metallic tubing, except rigid plastic conduit may be used under slab-on-grade. All conductors shall be color coded. Conductors used for the same functions shall be similarly color coded. Wiring code color shall remain uniform throughout the circuit. Pigtail or T-tap connections to alarm initiating, supervisory circuits, and alarm indicating circuits are prohibited. T-tapping using screw terminal blocks is allowed for addressable systems.

2.7.4 Special Tools and Spare Parts

Special tools necessary for the maintenance of the equipment shall be furnished. Two spare fuses of each type and size required and five spare lamps and LED's of each type shall be furnished. Two percent of the total number of each different type of detector, but no less than two each, shall be furnished. Fuses and lamps shall be mounted in the fire alarm panel.

PART 3 EXECUTION

3.1 INSTALLATION

All work shall be installed as shown and in accordance with the manufacturer's diagrams and recommendations, unless otherwise specified. Smoke detectors shall not be installed until the building has been thoroughly cleaned.

3.1.1 Power Supply for the System

A single dedicated circuit connection for supplying power to each building fire alarm system shall be provided. The primary power shall be supplied as shown on the drawings. The power supply shall be equipped with a locking mechanism and marked "FIRE ALARM CIRCUIT CONTROL".

3.1.2 Wiring

Conduit size for wiring shall be in accordance with NFPA 70. Wiring for the fire alarm system shall not be installed in conduits, junction boxes, or outlet boxes with conductors of lighting and power systems. No more than one conductor shall be installed under any screw terminal. All circuit conductors entering or leaving any mounting box, outlet box enclosure or cabinet shall be connected to screw terminals with each terminal marked in accordance with the wiring diagram. Connections and splices shall be made using screw terminal blocks. The use of wire nut type connectors are prohibited in the system. Wiring within any control equipment shall be readily accessible without removing any component parts.

The fire alarm equipment manufacturer's representative shall be present for the connection of wiring to the control panel.

3.1.3 Control Panel

The control panel and its assorted components shall be mounted so that no part of the enclosing cabinet is less than 300 mm nor more than 2 m above the finished floor. All manually operable controls shall be between 900 mm to 1.1 m above the finished floor. Panel shall be installed to comply with the requirements of UL 864.

3.1.4 Detectors

Detectors shall be installed in accordance with NFPA 72. Detectors shall be at least 300 mm from any part of any lighting fixture. Detectors shall be located at least 900 mm from diffusers of air handling systems. Each detector shall be provided with appropriate mounting hardware as required by its mounting location. Detectors which mount in free space shall be mounted directly to the end of the stubbed down rigid conduit drop. Conduit drops shall be firmly secured to minimize detector sway. Where length of conduit drop from ceiling or wall surface exceeds 900 mm, sway bracing shall be provided.

3.1.5 Notification Appliances

Notification appliances shall be mounted a minimum of 2.4 m above the finished floor unless limited by ceiling height or otherwise indicated.

3.1.6 Transceiver Equipment

Transceiver shall be installed per manufacturer's recommendations. Ground shall be provided through ground wire and not by conduit only. Ground wires shall be encased in conduit and bonded as per NFPA 70. Lightning arrestor shall be mounted no higher than 1.83 m (6 ft) above finished floor or ground level. The contractor shall be responsible for accurate programming of the transceiver and any costs incurred to the government from improper transceiver programming. During the test period the transceiver shall respond properly to each of the D-500 central stations of the base fire department. Periodically various zone inputs may be shorted or opened to simulate alarm and trouble signals. The transceiver shall transmit proper codes to the base fire department. After an error free test period the transceiver shall be interfaced to the fire alarm panel.

3.2 OVERVOLTAGE AND SURGE PROTECTION

All equipment connected to alternating current circuits shall be protected from surges per IEEE C62.41 and NFPA 70. All cables and conductors which serve as communications links, except fiber optics, shall have surge protection circuits installed at each end. Fuses shall not be used for surge protection.

3.3 GROUNDING

Grounding shall be provided to building ground or ground rods shall be driven. Maximum impedance to ground shall be 25 ohms.

3.4 TESTING

The Contractor shall notify the Contracting Officer 30 days before the preliminary and acceptance tests are to be conducted. The tests shall be performed in accordance with the approved test procedures in the presence of the Contracting Officer. The control panel manufacturer's representative shall be present to supervise all tests. The Contractor shall furnish all instruments and personnel required for the tests.

3.4.1 Preliminary Tests

Upon completion of the installation, the system shall be subjected to functional and operational performance tests including tests of each installed initiating and notification appliance. Tests shall include the meggering of all system conductors to determine that the system is free from grounded, shorted, or open circuits. The megger test shall be conducted prior to the installation of fire alarm equipment. If deficiencies are found, corrections shall be made and the system shall be retested to assure that it is functional.

3.4.2 Acceptance Test

Testing shall be in accordance with NFPA 72. The recommended tests in NFPA 72 shall be considered mandatory and shall verify that all previous deficiencies have been corrected. The test shall include the following:

- a. Test of each function of the control panel.

- b. Test of each circuit in both trouble and normal modes.
- c. Tests of alarm initiating devices in both normal and trouble conditions.
- d. Tests of each control circuit and device.
- e. Tests of each alarm notification appliance.
- f. Tests of the battery charger and batteries.
- g. Complete operational tests under emergency power supply.
- h. Visual inspection of all wiring connections.
- i. Opening the circuit at each alarm initiating device and notification appliance to test the wiring supervisory feature.
- j. Ground fault
- k. Short circuit faults
- l. Stray voltage
- m. Loop resistance

3.5 TRAINING

Training course shall be provided for the operations and maintenance staff.

The course shall be conducted in the building where the system is installed or as designated by the Contracting Officer. The training period shall consist of one training day (8 hours per day) and shall start after the system is functionally completed but prior to final acceptance tests. The instructions shall cover all of the items contained in the operating and maintenance instructions.

-- End of Section --

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SECTION 16725

INTRUSION DETECTION SYSTEMS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI C2	(1997) National Electrical Safety Code
ANSI X3.64	(1979; R 1990) Additional Controls for Use with American National Standard Code for Information Interchange
ANSI X3.92	(1981; R 1987) Data Encryption Standard
ANSI X3.154	(1988) Office Machines and Supplies - Alphanumeric Machines-Keyboards Arrangement

CODE OF FEDERAL REGULATIONS (CFR)

47 CFR 15	Radio Frequency Devices
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DEPARTMENT OF DEFENSE (DOD)

DOD 3235.1	(Rev H) Test & Evaluation of System Reliability Availability and Maintainability - A Primer
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ELECTRONIC INDUSTRIES ASSOCIATION (EIA)

EIA 170	(1957) Electrical Performance Standards - Monochrome Television Studio Facilities
EIA 232-E	(1991) Interface Between Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Data Interchange
EIA 310-D	(1992) Cabinets, Racks, Panels, and Associated Equipment

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C62.41	(1991) Surge Voltages in Low-Voltage AC Power Circuits
IEEE Std 100	(1992) IEEE Standard Dictionary of Electrical and Electronics Terms
IEEE Std 142	(1991) IEEE Recommended Practice for Grounding of Industrial and Commercial Power Systems

MILITARY HANDBOOKS (MIL-HDBK)

MIL-HDBK 759 (Rev B) Human Factors Engineering Design
For Army Materiel

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250 (1991) Enclosures for Electrical Equipment
(1000 Volts Maximum)

NEMA ICS 1 (1993) Industrial Controls and Systems

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (1996) National Electrical Code

UNDERWRITERS LABORATORIES (UL)

UL 6 (1993) Rigid Metal Conduit

UL 639 (1993; Rev Jul 1994) Intrusion-Detection
Units

UL 796 (1993) Printed-Wiring Boards

1.2 SYSTEM DESCRIPTION

1.2.1 General

The Contractor shall configure the Intrusion Detection System (IDS) as described and shown including Government Furnished Equipment. All computing devices, as defined in 47 CFR 15, shall be certified to comply with the requirements for Class A computing devices and labeled as set forth in 47 CFR 15. The system shall provide operator interaction and dynamic process manipulation, including overall system supervision, and control. Alarm data shall be obtained from local processors which are located within the protected zone.

1.2.2 Overall System Reliability Requirement

The system, including all components and appurtenances, shall be configured and installed to yield a mean time between failure (MTBF), as defined in IEEE Std 100, of at least 2000 hours continuous operation. Mean time between failure shall be calculated based on the configuration specified in paragraph Overall System Reliability Calculations.

1.2.3 Alarm Classifications

1.2.3.1 Intrusion Alarm

The annunciation of an alarm resulting from the detection of a specified target and which represents an attempt to intrude into the protected area.

1.2.3.2 Nuisance Alarm

The annunciation of an alarm resulting from the detection of an alarm stimuli but which does not represent an attempt to intrude into the protected area.

1.2.3.3 Environmental Alarm

The annunciation of an alarm resulting from environmental conditions which exceed those specified.

1.2.3.4 False Alarm

The annunciation of an alarm when there is no alarm stimuli.

1.2.4 Probability of Detection

Each zone shall have a continuous probability of detection greater than 90 percent and shall be demonstrated with a confidence level of 95 percent. This probability of detection equates to 49 successful detections out of 50 tests or 96 successful detections out of 100 tests. A false alarm rate of less than 1 false alarm per sensor per 5 days shall be provided at this probability of detection.

1.2.5 Standard Intruder

The system shall be able to detect an intruder that has the characteristics of a 5th percentile U.S. Army female as defined in MIL-HDBK 759. The intruder shall be dressed in a long-sleeve shirt, slacks, and shoes unless environmental conditions at the site require protective clothing.

1.2.6 Standard Intruder Movement

Movement of the standard intruder is defined as any movement; such as walking, running, crawling, rolling, and jumping. The system shall detect a standard intruder moving through a protected zone in the most advantageous manner for the intruder.

1.2.7 Electrical Requirements

Electrically powered IDS equipment shall operate on 120 volt 60 Hz AC sources as shown. Equipment shall be able to tolerate variations in the voltage source of plus or minus 10 percent, and variations in the line frequency of plus or minus 2 percent with no degradation of performance.

1.2.8 Power Line Surge Protection

Equipment connected to alternating current circuits shall be protected from power line surges. Equipment protection shall withstand surge test waveforms described in IEEE C62.41. Fuses shall not be used for surge protection.

1.2.9 Sensor Wiring and Communication Circuit Surge Protection

Inputs shall be protected against surges induced on sensor wiring. Outputs shall be protected against surges induced on control and sensor wiring installed outdoors and as shown. All communications equipment shall be protected against surges induced on any communications circuit. All cables and conductors, except fiber optics, which serve as communications circuits from the console to field equipment, and between field equipment, shall have surge protection circuits installed at each end. Protection shall be furnished at equipment, and additional triple electrode gas surge protectors rated for the application on each wireline circuit shall be installed within 900 mm of the building cable entrance. Fuses shall not

be used for surge protection. The inputs and outputs shall be tested in both normal mode and common mode using the following two waveforms:

- a. A 10 microsecond rise time by 1000 microsecond pulse width waveform with a peak voltage of 1500 volts and a peak current of 60 amperes.
- b. An 8 microsecond rise time by 20 microsecond pulse width waveform with a peak voltage of 1000 volts and a peak current of 500 amperes.

1.2.10 Power Line Conditioners

A power line conditioner shall be furnished for data gathering panel. . The power line conditioners shall be of the ferro-resonant design, with no moving parts and no tap switching, while electrically isolating the secondary from the power line side. The power line conditioners shall be sized for 125 percent of the actual connected kVA load. Characteristics of the power line conditioners shall be as follows:

- a. At 85 percent load, the output voltage shall not deviate by more than plus or minus 1 percent of nominal when the input voltage fluctuates between minus 20 percent to plus 10 percent of nominal.
- b. During load changes of zero to full load, the output voltage shall not deviate by more than plus or minus 3 percent of nominal. Full correction of load switching disturbances shall be accomplished within 5 cycles, and 95 percent correction shall be accomplished within 2 cycles of the onset of the disturbance.
- c. Total harmonic distortion shall not exceed 3-1/2 percent at full load.

1.2.11 System Reaction

1.2.11.1 System Response

All alarms shall be annunciated within 1 second of their occurrence. This response time shall be maintained during system heavy load.

1.2.12 Environmental Conditions

1.2.12.1 Interior, Controlled Environment

All system components installed in interior locations having controlled environments shall be rated for continuous operation under ambient environmental conditions of 1.7 to plus 48.9 degrees C (35 to 120 degrees F) dry bulb and 20 to 90 percent relative humidity, noncondensing.

1.2.13 System Capacity

The system shall monitor and control the number of inputs and outputs shown and shall include an expansion capability of a minimum of 25 percent.

1.3 DELIVERY OF TECHNICAL DATA

All items of technical data which is specifically identified in this specification shall be delivered in accordance with the CONTRACT CLAUSES, SPECIAL CLAUSES, Section 01300 SUBMITTAL PROCEDURES. All data delivered

shall be identified by reference to the particular specification paragraph against which it is furnished.

1.3.1 Group I Technical Data Package

1.3.1.1 System Drawings

The data package shall include the following:

- a. System block diagram.
- b. Local processor installation, typical block, and wiring diagrams.
- c. Local processor physical layout and schematics.
- d. Sensor wiring and installation drawings.
- e. Details of connections to power sources, including power supplies and grounding.
- f. Details of surge protection device installation.
- g. Sensor detection patterns.

1.3.1.2 Manufacturers' Data

The data package shall include manufacturers' data for all materials and equipment, including sensors, local processors and equipment provided under this specification.

1.3.1.3 System Description and Analyses

The data package shall include system descriptions, analyses, and calculations used in sizing equipment required by these specifications. Descriptions and calculations shall show how the equipment will operate as a system to meet the performance of this specification. The data package shall include the following:

- a. Communication speed and protocol description.
- b. Alarm response time calculations.
- c. Command response time calculations.
- d. Start-up operations.
- e. Sample copy of each report specified.

1.3.1.4 Certifications

All specified manufacturer's certifications shall be included with the data package.

1.3.2 Group IV Technical Data Package

The Contractor shall prepare test procedures and reports for the performance verification test and the endurance test. The Contractor shall deliver the performance verification test and endurance test procedures to the Government for approval. After receipt by the Contractor of written

approval of the test procedures, the Contractor may schedule the tests. The final performance verification and endurance test report shall be delivered after completion of the tests.

1.3.2.1 Operation and Maintenance Manuals

A draft copy of the operation and maintenance manuals, as specified for the Group V technical data package, shall be delivered to the Government prior to beginning the performance verification test for use during site testing.

1.3.2.2 Training Documentation

Lesson plans and training manuals for the training phases, including type of training to be provided, and a list of reference material, shall be delivered for approval.

1.3.2.3 Data Entry

The Contractor shall enter all data needed to make the system operational. The Contractor shall deliver the data to the Government on data entry forms, utilizing data from the contract documents, Contractor's field surveys, and all other pertinent information in the Contractor's possession required for complete installation of the data base. The Contractor shall identify and request from the Government, any additional data needed to provide a complete and operational IDS. The completed forms shall be delivered to the Government for review and approval at least 90 days prior to the Contractor's scheduled need date.

1.3.3 Group V Technical Data Package

Final copies of the manuals as specified, bound in hardback loose-leaf binders, shall be delivered to the Government within 30 days after completing the endurance test. The draft copy used during site testing shall be updated with any changes required prior to final delivery of the manuals. Each manual's contents shall be identified on the cover. The manual shall include names, addresses, and telephone numbers of each subcontractor installing equipment and systems, and nearest service representatives for each item of equipment for each system. The manuals shall have a table of contents and tab sheets. Tab sheets shall be placed at the beginning of each chapter or section and at the beginning of each appendix. The final copies delivered after completion of the endurance test shall include all modifications made during installation, checkout, and acceptance. The number of copies to be provided shall be as specified on DD Form 1423.

1.3.3.1 Functional Design Manual

The functional design manual shall identify the operational requirements for the system and explain the theory of operation, design philosophy, and specific functions.

1.3.3.2 Operator's Manual

The operator's manual shall fully explain all procedures and instructions for the operation of the system, including:

- a. System start-up and shutdown procedures.
- b. Use of system, command, and applications software.

- c. Recovery and restart procedures.
- d. Use of report generator and generation of reports.
- e. Data entry.
- f. Operator commands.
- g. Alarm messages and printing formats.
- h. System access requirements.

1.3.3.3 Maintenance Manual

The maintenance manual shall describe maintenance for all equipment including inspection, periodic preventive maintenance, fault diagnosis, and repair or replacement of defective components.

1.3.3.4 Final System

The Contractor shall maintain a separate set of drawings, elementary diagrams and wiring diagrams of the IDS to be used for final system drawings. This set shall be accurately kept up to date by the Contractor with all changes and additions to the IDS and shall be delivered to the Government with the final endurance test report. In addition to being complete and accurate, this set of drawings shall be kept neat and shall not be used for installation purposes. Upon completion of the final system drawings, a representative of the Government will review the final system work with the Contractor. If the final system work is not complete, the Contractor will be so advised and shall complete the work as required. Final drawings submitted with the endurance test report shall be finished drawings on mylar or vellum.

1.4 TESTING

1.4.1 General

The Contractor shall perform predelivery testing, site testing, and adjustment of the completed intrusion detection system. The Contractor shall provide all personnel, equipment, instrumentation, and supplies necessary to perform all testing. Written notification of planned testing shall be given to the Government at least 14 days prior to the test, and in no case shall notice be given until after the Contractor has received written approval of the specific test procedures.

1.4.2 Test Procedures and Reports

Test procedures shall explain in detail, step-by-step actions and expected results demonstrating compliance with the requirements of the specification. Test reports shall be used to document results of the tests. Reports shall be delivered to the Government within 7 days after completion of each test.

1.5 TRAINING

1.5.1 General

The Contractor shall conduct training courses for designated personnel in

the maintenance and operation of the IDS as specified. The training shall be oriented to the specific system being installed under this contract. Training manuals shall be delivered for each trainee with two additional copies delivered for archiving at the project site. The manuals shall include an agenda, defined objectives for each lesson, and a detailed description of the subject matter for each lesson. The Contractor shall furnish all audio-visual equipment and all other training materials and supplies. Where the Contractor presents portions of the course by audio-visual material, copies of the audio-visual material shall be delivered to the Government, either as a part of the printed training manuals or on the same media as that used during the training sessions. A training day is defined as 8 hours of classroom instruction, including two 15 minute breaks and excluding lunchtime, Monday through Friday, during the daytime shift in effect at the training facility. For guidance in planning the required instruction, the Contractor should assume that attendees will have a high school education or equivalent, and are familiar with intrusion detection systems. Approval of the planned training schedule shall be obtained from the Government at least 30 days prior to the training.

1.5.2 Maintenance Personnel Training

The system maintenance course shall be taught at the project site after completion of the endurance test for a period of 5 training days. A maximum of 5 personnel designated by the Government will attend the course. The training shall include:

- a. Physical layout of each piece of hardware.
- b. Troubleshooting and diagnostics procedures.
- c. Repair instructions.
- d. Preventive maintenance procedures and schedules.
- e. Calibration procedures.

Upon completion of this course, the students shall be fully proficient in the maintenance of the system.

1.6 LINE SUPERVISION

1.6.1 Signal and Data Transmission Media (DTM) Line Supervision

All signal or DTM lines between sensors and the alarm annunciator located in data gathering panel shall be supervised by the system. The system shall supervise the signal lines by monitoring changes in the direct current that flows through the signal lines and a terminating resistor. The system shall initiate an alarm in response to a current change of 10 percent or greater. The system shall also initiate an alarm in response to opening, closing, shorting, or grounding of the signal and DTM lines.

1.7 EXPERIENCE

The contractor shall submit written proof that the following experience requirements are being met.

1.7.1 Hardware Manufacturer Experience

All system components shall be produced by manufacturers who have been

regularly engaged in the production of intrusion detection system components of the types to be installed for at least 5 years.

1.7.2 System Installer Experience

The system shall be installed by a contractor who has been regularly engaged in the installation of intrusion detection systems of similar type and complexity as the specified system for at least 2 years.

1.8 MAINTENANCE AND SERVICE

1.8.1 General Requirements

The Contractor shall provide all services required and equipment necessary to maintain the entire intrusion detection system in an operational state as specified for a period of 1 year after formal written acceptance of the system, and shall provide all necessary material required for performing scheduled adjustments or other nonscheduled work.

1.8.2 Description of Work

The adjustment and repair of intrusion detection system includes all communications transmission equipment and DTM, local processors, and all new IDS sensors and support equipment. Responsibility shall be limited to Contractor installed equipment. The contractor shall provide the manufacturer's required adjustments and all other work necessary.

1.8.3 Personnel

Service personnel shall be certified in the maintenance and repair of similar types of equipment and qualified to accomplish all work promptly and satisfactorily. The Government shall be advised in writing of the name of the designated service representative, and of any change in personnel.

1.8.4 Schedule of Work

The Contractor shall perform two minor inspections at 6 month intervals (or more often if required by the manufacturer), and two major inspections offset equally between the minor inspections to effect quarterly inspection of alternating magnitude.

1.8.4.1 Minor Inspections

These inspections shall include:

- a. Visual checks and operational tests of all console equipment, peripheral equipment, local processors, sensors, and electrical and mechanical controls.
- b. Mechanical adjustments, new ribbons, and other necessary adjustments on printers.

1.8.4.2 Major Inspections

These inspections shall include all work described under paragraph Minor Inspections and the following work:

- a. Clean all system equipment, local processors, including interior and exterior surfaces.

- b. Perform diagnostics on all equipment.
- c. Check, walk test, and calibrate each sensor.
- d. Run all system software diagnostics and correct all diagnosed problems.
- e. Resolve any previous outstanding problems.

1.8.4.3 Scheduled Work

This work shall be performed during regular working hours, Monday through Friday, excluding federal holidays.

1.8.5 Emergency Service

The Government will initiate service calls when the intrusion detection system is not functioning properly. Qualified personnel shall be available to provide service to the complete intrusion detection system. The Government shall be furnished with a telephone number where the service supervisor can be reached at all times. Service personnel shall be at site within 2 hours after receiving a request for service. The intrusion detection system shall be restored to proper operating condition within 2 hours after service personnel arrive on site.

1.8.6 Operation

Performance of scheduled adjustments and repair shall verify operation of the intrusion detection system as demonstrated by the applicable tests of the performance verification test.

1.8.7 Records and Logs

The Contractor shall keep records and logs of each task, and shall organize cumulative records for each component, and for the complete system chronologically. A continuous log shall be maintained for all devices. The log shall contain all initial settings. Complete logs shall be kept and shall be available for inspection on site, demonstrating that planned and systematic adjustments and repairs have been accomplished for the intrusion detection system.

1.8.8 Work Requests

The Contractor shall separately record each service call request, as received. The form shall include the serial number identifying the component involved, its location, date and time the call was received, specific nature of trouble, names of service personnel assigned to the task, instructions describing what has to be done, the amount and nature of the materials to be used, the time and date work started, and the time and date of completion. The Contractor shall deliver a record of the work performed within 5 days after work is accomplished.

1.8.9 System Modifications

The Contractor shall make any recommendations for system modification in writing to the Government. No system modifications, shall be made without prior approval of the Government. Any modifications made to the system shall be incorporated into the operations and maintenance manuals, and

other documentation affected.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

2.1.1 Materials and Equipment

Units of the same type of equipment shall be products of a single manufacturer. All material and equipment shall be new and currently in production. Each major component of equipment shall have the manufacturer's model and serial number in a conspicuous place.

2.1.2 Enclosures

System enclosures shall be metallic as shown.

2.1.2.1 Interior Sensor

Sensors to be used in an interior environment shall be housed in an enclosure that provides protection against dust, falling dirt, and dripping noncorrosive liquids.

2.1.2.2 Interior Electronics

System electronics to be used in an interior environment shall be housed in enclosures which meet the requirements of NEMA 250 Type 12.

2.1.3 Nameplates

Laminated plastic nameplates shall be provided for data gathering panel components. Laminated plastic shall be 3.2 mm (1/8 in.) thick, white with black center core. Nameplates shall be a minimum of 25 by 75 mm, with minimum 6.4 mm (1/4 in.) high engraved block lettering. Nameplates shall be attached to the inside of the enclosure housing the local processor. Other major components of the system shall have the manufacturer's name, address, type or style, model or serial number, and catalog number on a corrosion resistant plate secured to the item of equipment. Nameplates will not be required for devices smaller than 25 by 75 mm.

2.1.4 Tamper Provisions

2.1.4.1 Tamper Switches

Enclosures, cabinets, housings, boxes, and fittings of every description having hinged doors or removable covers and which contain circuits or connections of the intrusion detection system and its power supplies, shall be provided with cover operated, corrosion-resistant tamper switches, arranged to initiate an alarm signal when the door or cover is moved. Tamper switches shall be mechanically mounted to maximize the defeat time when enclosure covers are opened or removed. It shall take longer than 1 second to depress or defeat the tamper switch after opening or removing the cover. The enclosure and the tamper switch shall function together in such a manner as to not allow direct line of sight to any internal components before the switch activates. Tamper switches shall be inaccessible until the switch is activated; have mounting hardware so concealed that the location of the switch cannot be observed from the exterior of the enclosure; be connected to circuits which are under electrical supervision at all times, irrespective of the protection mode in which the circuit is

operating; shall be spring-loaded and held in the closed position by the door or cover; and shall be wired so that they break the circuit when the door or cover is disturbed.

- a. Nonsensor Enclosures: Tamper switches on nonsensor enclosures, which must be opened to make routine maintenance adjustments to the system and to service the power supplies, shall be push/pull-set, automatic reset type.
- b. Sensor Enclosures: Tamper switches on sensor enclosures, which must be opened to make routine maintenance adjustments to the sensor, shall be single pole single throw type.

2.1.4.2 Enclosure Covers

Covers of pull and junction boxes provided to facilitate initial installation of the system need not be provided with tamper switches if they contain no splices or connections, but shall be protected by tack welding or brazing the covers in place. Zinc labels shall be affixed to such boxes indicating they contain no connections. These labels shall not indicate that the box is part of the intrusion detection system.

2.1.4.3 Conduit-Enclosure Connections

All conduit-enclosure connections shall be protected by tack welding or brazing the conduit to the enclosure. Tack welding or brazing shall be done in addition to standard conduit-enclosure connection methods as described in NFPA 70.

2.1.5 Locks and Key-Lock Switches

2.1.5.1 Locks

Locks required to be installed on system enclosures for maintenance purposes shall be UL listed, conventional key type lock having a combination of five cylinder pin and five-point three position side bar. Keys shall be stamped "U.S. GOVT. DO NOT DUP." The locks shall be so arranged that the key can only be withdrawn when in the locked position. All maintenance locks shall be keyed alike and only two keys shall be furnished for all of these locks.

2.1.5.2 Key-Lock-Operated Switches

All key-lock-operated switches required to be installed on system components shall be UL listed, conventional key type lock having a combination of five cylinder pin and five-point three position side bar. Keys shall be stamped "U.S. GOVT. DO NOT DUP." Key-lock-operated switches shall be two position, with the key removable in either position. All key-lock-operated switches shall be keyed differently and only two keys shall be furnished for each key-lock-operated-switch.

2.1.6 System Component Design

IDS components shall be designed for continuous operation. Electronic components shall be solid state type, mounted on printed circuit boards conforming to UL 796. Printed circuit board connectors shall be plug-in, quick-disconnect type. Power dissipating components shall incorporate safety margins of not less than 25 percent with respect to dissipation ratings, maximum voltages, and current carrying capacity. Light duty

relays and similar switching devices shall be solid state type or sealed electromechanical.

2.1.6.1 Modularity

The Contractor shall provide equipment designed for increase of system capability by installation of component modules. System components shall be designed to facilitate maintenance through replacement of modular subassemblies and parts.

2.1.6.2 Maintainability

Components shall be designed to be maintained using commercially available tools and equipment. Components shall be arranged and assembled so they are accessible to maintenance personnel. There shall be no degradation in tamper protection, structural integrity, EMI/RFI attenuation, or line supervision after maintenance when it is performed in accordance with manufacturer's instructions. The system shall be configured and installed to yield a mean time to repair (MTTR) of not more than 8 hours. Repair time is the clock time from the time maintenance personnel are given entrance to the IDS and begin work, until the IDS is fully functional.

2.1.6.3 Interchangeability

The system shall be constructed with off-the-shelf components which are physically, electrically and functionally interchangeable with equivalent components as complete items. Replacement of equivalent components shall not require modification of either the new component or of other components with which the replacement items are used. Custom designed or one-of-a-kind items shall not be used. Interchangeable components or modules shall not require trial and error matching in order to meet integrated system requirements, system accuracy, or restore complete system functionality.

2.1.6.4 Electromagnetic and Radio Frequency Interference (EMI/RFI)

IDS components generating EMI/RFI shall be designed and constructed in accordance with 47 CFR 15.

2.1.6.5 Product Safety

IDS components shall conform to applicable rules and requirements of NFPA 70. IDS components, shall be equipped with instruction plates including warnings and cautions, describing physical safety, and special or important procedures to be followed in operating and servicing IDS equipment.

2.1.7 Controls and Designations

Controls and designations shall be as specified in NEMA ICS 1.

2.1.8 Special Test Equipment

The Contractor shall provide all special test equipment, special hardware, software, tools, and programming or initialization equipment needed to start or maintain any part of the system and its components. Special test equipment is defined as any test equipment not normally used in an electronics maintenance facility.

2.1.9 Alarm Output

The alarm output of each sensor shall be a single pole double throw (SPDT) contact rated for a minimum of 0.25 A at 24 volts DC.

2.1.10 Indicator Lights

Indicator lights used throughout the system shall be light emitting diodes (LED) or long life incandescent lamps. The indicator lights used shall be visible from a distance of 9.1 meters in an area illuminated to 800 lx. The indicator lights shall conform to the following color coding:

- a. RED shall be used to alert an operator that a zone is in alarm and that the alarm has been acknowledged.
- b. FLASHING RED shall be used to alert an operator that a zone has gone into an alarm or that primary power has failed.
- c. YELLOW shall be used to advise an operator that a zone is in access.
- d. GREEN shall be used to indicate that a zone is secure or that power is on.

2.1.11 Access/Secure Switches

An access/secure switch shall be used to place a protected zone in ACCESS. The switch shall consist of a double pull key-operated switch housed in a NEMA 12 equivalent enclosure. The switch shall disable all sensor alarm outputs with the exception of tamper alarm outputs within the protected zone and sensors in zones above false ceilings or other inaccessible locations as shown.

2.2 INTERIOR SENSORS

2.2.1 Balanced Magnetic Switch (BMS)

The BMS shall detect a 6.4 mm (1/4 in.) of separating relative movement between the magnet and the switch housing. Upon detecting such movement, it shall transmit an alarm signal to the alarm annunciation system.

2.2.1.1 BMS Subassemblies

The BMS shall consist of a switch assembly and an actuating magnetic assembly. The switch mechanism shall be of the balanced magnetic type. Each switch shall be provided with an overcurrent protective device, rated to limit current to 80 percent of the switch capacity. Switches shall be rated for a minimum lifetime of one million operations. The magnet assembly shall house the actuating magnet.

2.2.1.2 Housing

The housings of surface mounted switches and magnets shall be made of nonferrous metal and shall be weatherproof. The housings of recess mounted switches and magnets shall be made of nonferrous metal or plastic.

2.2.1.3 Remote Test

A remote test capability shall be provided. The remote test shall be initiated when commanded by the alarm annunciation system. The remote test

shall activate the sensor's switch mechanism causing an alarm signal to be transmitted to the alarm annunciation system. The remote test shall simulate the movement of the actuating magnet relative to the switch subassembly.

2.2.2 Microwave Motion Sensor

The microwave motion sensor shall detect changes in the microwave signal. Upon detecting such changes, the sensor shall transmit an alarm signal to the alarm annunciation system. The sensor shall detect a standard intruder moving within the sensor's detection pattern at a speed of 0.091 to 2.29 meters per second. The sensor shall comply with 47 CFR 15, Subpart F. The sensor's coverage pattern shall be as shown. The sensitivity of the sensor shall be adjustable by controls within the sensor. The controls shall not be accessible when the sensor housing is in place. The sensor shall be adjustable to obtain the coverage shown.

2.2.2.1 Test Indicator

The microwave motion sensor shall be equipped with an LED walk test indicator. The walk test indicator shall not be visible during normal operations. When visible, the walk test indicator shall light when the sensor detects an intruder. The sensor shall either be equipped with a manual control, located within the sensor's housing, to enable/disable the test indicator or the test indicator shall be located within the sensor such that it can only be seen when the housing is open/removed.

2.2.2.2 Remote Test

A remote test capability shall be provided. The remote test hardware may be integral to the sensor or a separate piece of equipment. The remote test shall be initiated when commanded by the alarm annunciation system. The remote test shall excite the sensing element and associated electronics causing an alarm signal to be transmitted to the alarm annunciation system.

The sensor stimulation generated by the remote test hardware shall simulate a standard intruder moving within the sensor's detection pattern.

2.2.3 Passive Infrared Motion Sensor

The passive infrared motion sensor shall detect changes in the ambient level of infrared emissions caused by the movement of a standard intruder within the sensor's field of view. Upon detecting such changes, the sensor shall transmit an alarm signal to the alarm annunciation system. The sensor shall detect a change in temperature of no more than 1.1 degrees C (2.0 degrees F), and shall detect a standard intruder traveling within the sensor's detection pattern at a speed of 0.091 to 2.29 meters per second across two adjacent segments of the field of view. Emissions monitored by the sensor shall be in the 8 to 14 micron range. The sensor shall be adjustable to obtain the coverage pattern shown. The sensor shall be equipped with a temperature compensation circuit.

2.2.3.1 Test Indicator

The passive infrared motion sensor shall be equipped with an LED walk test indicator. The walk test indicator shall not be visible during normal operations. When visible, the walk test indicator shall light when the sensor detects an intruder. The sensor shall either be equipped with a manual control, located within the sensor's housing, to enable/disable the test indicator or the test indicator shall be located within the sensor

such that it can only be seen when the housing is open/removed.

2.2.3.2 Remote Test

A remote test capability shall be provided. The remote test hardware may be integral to the sensor or a separate piece of equipment. The remote test shall be initiated when commanded by the alarm annunciation system. The remote test shall excite the sensing element and associated electronics causing an alarm signal to be transmitted to the alarm annunciation system.

The sensor stimulation generated by the remote test hardware shall simulate a standard intruder moving within the sensor's detection pattern.

2.2.4 Dual Tech Sensor

Dual technology type sensor shall contain the requirements for both the microwave and passive infrared sensors as indicated herein above. Sensor shall alarm when both microwave and infrared elements are activated simultaneously.

2.3 ALARM ANNUNCIATION SYSTEM

The alarm annunciation system shall be configured as a modular digital computer based system as shown. The alarm annunciation system shall provide operator interface, interaction and dynamic real-time process manipulation, including overall system supervision, coordination and control. The alarm annunciation system shall consist of a console, alarm annunciation system, dedicated communications network, system software and application software.

2.3.1 Local Processor.(Intrusion Detection Panel)

The local processor shall monitor associated sensors and issue commands over supervised communication lines. The local processor shall have inputs and outputs as shown. The local processor shall have on-board data equipment for communication with the central computer. The local processor shall include a real-time clock/calendar. The local processor shall have memory with capacity to store 1 alarm, including time of occurrence, per input. Alarms occurring during a communication outage shall be recorded and retained in the local processor memory and reported to the central memory files upon restoration of communications. The local processor shall begin the report to the central memory files within 10 seconds of communications restoration. Local processor operations shall be fully supervised by the central computer. The central computer shall detect and report any local processor failures, including communications and power problems.

2.3.1.1 Inputs

The inputs shall accept sensor on-off, open-close, or other change of state (two state data) indications.

2.3.1.2 Outputs

The outputs shall provide contact closures for momentary and maintained or latching operation as required. Closures shall have a minimum duration of 0.1 second. Output relays shall have an initial breakdown voltage between contacts and coil of at least 500 volt AC peak. Minimum contact rating shall be 1 ampere at 24 volt AC.

2.3.1.3 Local Processor Power Supply

Local processor and sensors shall be powered from an uninterruptible power source. The uninterruptible Power Source shall provide 4 hours of battery back-up power in the event of primary power failure and shall automatically fully recharge the batteries within 12 hours after primary power is restored. There will be no equipment malfunctions or perturbations or loss of data during the switch from primary to battery power and vice versa. Batteries shall be sealed, non-outgassing type.

2.3.1.4 Auxiliary Equipment Power

A 120 volts AC, 20 A, 60 Hz duplex GFI outlet shall be furnished inside the local processor's enclosure.

2.4 WIRE AND CABLE

2.4.1 General

The Contractor shall provide all wire and cable not indicated as Government furnished equipment. All wiring shall meet NFPA 70 standards.

2.4.2 Above Ground Sensor Wiring

Sensor wiring shall be 20 AWG minimum, twisted and shielded, 2, 3, 4, or 6 pairs to match hardware. Multiconductor wire shall have an outer jacket of PVC.

2.4.3 Class 2 Low Energy Conductors

The conductor sizes specified for digital functions shall take precedence over any requirements for Class 2 low energy signal-circuit conductors specified elsewhere.

PART 3 EXECUTION

3.1 GENERAL

The Contractor shall install all system components, including Government furnished equipment, and appurtenances in accordance with the manufacturer's instructions, ANSI C2 and as shown, and shall furnish all necessary interconnections, services, and adjustments required for a complete and operable system as specified and shown.

3.1.1 Installation

All wiring, including low voltage wiring outside the cabinets, boxes, and similar enclosures, shall be installed in rigid galvanized steel conduit conforming to UL 6. Minimum size of conduit shall be 16 mm (1/2 in.). Connections shall be tight tapered threaded. No threadless fittings or couplings shall be used. Conduit outlet boxes, pull boxes, junction boxes, conduit fittings and similar enclosures shall be cast metal or malleable iron as specified in Section(s) 16415, with threaded hubs or bodies. Electric metallic tubing (EMT), armored cable, nonmetallic sheathed cable, or flexible conduit will not be permitted except where specifically shown. Cable shall not be pulled into conduits or placed in raceways, compartments, outlet boxes, junction boxes, or similar fittings with other building wiring. Flexible cords or cord connections shall not be used to supply power to any components of the intrusion detection system, except where specifically noted herein. All other electrical work shall be as

specified in Section(s) 16415 and as shown. Grounding shall be installed as necessary to preclude ground loops, noise, and surges from adversely affecting system operation.

3.1.2 Enclosure Penetrations

All enclosure penetrations shall be from the bottom unless the system design requires penetrations from other directions. Penetrations of interior enclosures involving transitions of conduit from interior to exterior, and all penetrations on exterior enclosures shall be sealed with an approved sealant as recommended by the cable manufacturer to preclude the entry of water. The conduit riser shall terminate in a hot-dipped galvanized metal cable terminator. The terminator shall be filled with an approved sealant as recommended by the cable manufacturer, and in such a manner that the cable is not damaged.

3.1.3 Cold Galvanizing

All field welds and/or brazing on factory galvanized components, such as boxes, enclosures, and conduits, shall be coated with a cold galvanized paint containing at least 95 per cent zinc by weight.

3.1.4 Installation - Software

The Contractor shall load all software as specified and required for an operational intrusion detection system, including data bases and all specified programs. Upon successful completion of the endurance test, the Contractor shall provide original and backup copies of all accepted software including diagnostics. Two sets of software, on media usable with the portable tester shall be provided.

3.2 SYSTEM STARTUP

The Contractor shall not apply power to the intrusion detection system until the following items have been completed:

- a. Intrusion detection system equipment items and cable have been set up in accordance with manufacturer's instructions.
- b. A visual inspection of the intrusion detection system has been conducted to ensure that defective equipment items have not been installed and that there are no loose connections.
- c. System wiring has been tested and verified as correctly connected as indicated.
- d. All system grounding and transient protection systems have been verified as properly installed and connected as indicated.
- e. Power supplies to be connected to the intrusion detection system have been verified as the correct voltage, phasing, and frequency as indicated.
- f. Satisfaction of the above requirements shall not relieve the Contractor of responsibility for incorrect installation, defective equipment items, or collateral damage as a result of Contractor work/equipment.

3.3 SUPPLEMENTAL CONTRACTOR QUALITY CONTROL

The following requirements supplement the contractor quality control requirements specified elsewhere in the contract. The contractor shall provide the services of technical representatives who are thoroughly familiar with all components and installation procedures of the installed IDS; and are approved by the Contracting Officer. These representatives will be present on the job site during the preparatory and initial phases of quality control to provide technical assistance. These representatives shall also be available on an as needed basis to provide assistance with follow-up phases of quality control. These technical representatives shall participate in the testing and validation of the system and shall provide certification that their respective system portions meet its contractual requirements.

3.4 SITE TESTING

3.4.1 General

The Contractor shall provide all personnel, equipment, instrumentation, and supplies necessary to perform all site testing. The Government will witness all performance verification and endurance testing. Written permission shall be obtained from the Government before proceeding with the next phase of testing. Original copies of all data produced during performance verification and endurance testing shall be turned over to the Government at the conclusion of each phase of testing prior to Government approval of the test.

3.4.2 Contractor's Field Testing

The Contractor shall calibrate and test all equipment, verify data transmission media (DTM) operation, place the integrated system in service, and test the integrated system. The Contractor shall deliver a report describing results of functional tests, diagnostics, and calibrations including written certification to the Government that the installed complete system has been calibrated, tested, and is ready to begin performance verification testing. The report shall also include a copy of the approved performance verification test procedure.

3.4.3 Performance Verification Test

The Contractor shall demonstrate that the completed IDS complies with the contract requirements. Using approved test procedures, all physical and functional requirements of the project shall be demonstrated and shown. The performance verification test, as specified, shall not be started until receipt by the Contractor of written permission from the Government, based on the Contractor's written request. This shall include certification of successful completion of testing as specified in paragraph Contractor's Field Testing, and upon successful completion of training as specified. The Government may terminate testing at any time when the system fails to perform as specified. Upon termination of testing by the Government or by the Contractor, the Contractor shall commence an assessment period as described for Endurance Testing Phase II. Upon successful completion of the performance verification test, the Contractor shall deliver test reports and other documentation, as specified, to the Government prior to commencing the endurance test.

3.4.4 Endurance Test

The Contractor shall demonstrate the specified probability of detection and

false alarm rate requirements of the completed system. The endurance test shall not be started until the Government notifies the Contractor, in writing, that the performance verification test is satisfactorily completed, training as specified has been completed, and correction of all outstanding deficiencies has been satisfactorily completed. The test shall be conducted 24 hours per day for 15 consecutive calendar days, including holidays, and the system shall operate as specified. Upon successful completion of the endurance test, the Contractor shall deliver test reports and other documentation as specified to the Government prior to acceptance of the system.

-- End of Section --